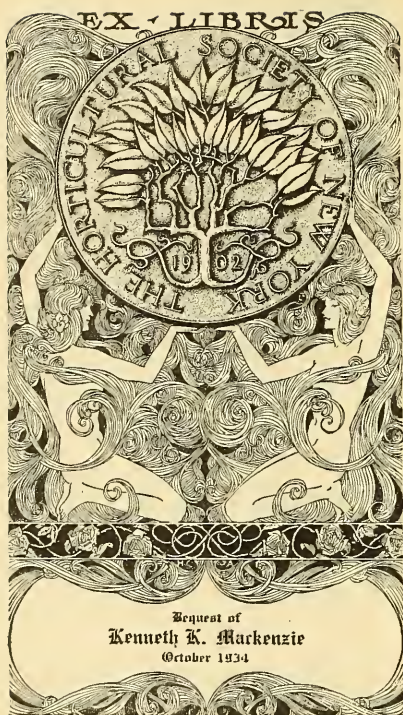






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THE NEW YORK BOTANICAL GARDEN

A CRITICAL REVISION OF THE GENUS EUCALYPTUS

BY

J. H. MAIDEN, I.S.O., F.R.S., F.L.S.

(Government Botanist of New South Wales and Director of the Botanic Gardens, Sydney).

VOL. IV.

PARTS 31—40.

(WITH 40 PLATES)

"Ages are spent in collecting materials, ages more in separating and combining them. Even when a system has been formed, there is still something to add, to alter, or to reject. Every generation enjoys the use of a vast hoard bequeathed to it by antiquity, and transmits that hoard, augmented by fresh acquisitions, to future ages. In these pursuits, therefore, the first speculators lie under great disadvantages, and even when they fail, are entitled to praise."

MACAULAY'S "ESSAY ON MILTON."

Published by Authority of
THE GOVERNMENT OF THE STATE OF NEW SOUTH WALES.

Sydney:

WILLIAM APPLGATE GULICK, GOVERNMENT PRINTER, PHILLIP-STREET.

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DESCRIPTION.

CLVIII. *E. tereticornis* Smith.

IN *Zoology and Botany of New Holland*, by G. Shaw and J. E. Smith, Vol i,
p. 41 (1793).

FOLLOWING is the original :—

E. tereticornis, operculo conico tereti lævissimo calyce triplo longiori, umbellis lateralibus solitariis.

Lid conical, round, very smooth, thrice as long as the calyx. Umbels lateral, solitary. The lid of this species is remarkably smooth and polished, not wrinkled even in the dry specimen; it often breaks off a little above the base, leaving its thin lower part like a loose ring round the calyx. The leaves are lanceolate.

In the *Transactions of the Linnean Society* iii, 284 (1797) the same author says :—

Remarkable for its long, very smooth, membranous operculum, which bursts just above the base, leaving the lower part like a ring sticking for some time to the calyx. The leaves are lanceolate and oblique.

Then it is described in DC. *Prod.* iii, 216 (1828), in Latin, in which the original is a little amplified.

Mueller in *Journ. Linn. Soc.* iii, 83 (1859) re-described the species in Latin, giving *E. subulata* A. Cunn., as a synonym.

Then it was described by Bentham in B. Fl. iii, 242, and later on by Mueller in "Eucalyptographia" with a plate. In this plate there are three twigs; the middle and right hand ones are those of *E. tereticornis*; the left hand one is that of *E. Bancrofti* Maiden.

It is a large tree, often 150 feet in height, and 6 feet in diameter at butt.

It is seldom found growing in a swamp, but where it does, it does not take on the characters of allied associated forms which prefer moister surroundings.

The leaves have usually well-marked veins, and contain very little essential oil.

The timber is straight and mostly sound, and is regarded as valuable both for the mill and for fencing.

Following are notes on three individual trees of this species in the Outer Domain and Botanic Gardens, Sydney. They were not planted by the hand of man, and are growing close to where the type was obtained.

1. Outer Domain, near Mrs. Macquarie's Chair. Young foliage thin, medium lanceolate, smells like orange blossom, very sweet.

2. A single tree in the north-eastern part of the Botanic Gardens (near the Cycad bed). Juvenile foliage broad and triplinerved. Intermediate and even mature foliage inclined to be triplinerved. (A reference photo. of tree was taken March, 1908).

3. Outer Domain, near foot of Governor-General's steps. Juvenile leaves medium lanceolate. Branchlets nearly winged.

These three trees, growing within a few hundred yards of each other, differ in flowering period, in habit and bark, in addition to the differences already indicated.

E. tereticornis is described at some length by Naudin, 6^e Série, Bot. T. xvi, p. 398 (1883). Quoted as 1st Mém. He lays special stress on its variability. It is variable, even with the strict definition of the species; it must also be borne in mind that, until recently, *E. tereticornis* was looked upon as including *E. amplifolia* Naudin, *E. Bancrofti* Maiden, *E. dealbata* A. Cunn. and even other species. We are gradually becoming better acquainted with the life histories of various forms of Eucalyptus.

The group, of which *E. tereticornis* is the best known member, is apparently in a state of flux, but it is believed that my attempt to classify the forms will be suggestive. This is no exception to the rule that obtains in other groups that the individuality of species varies. But in order to handle these forms at all, to avoid interminable and indefinite verbiage, it is desirable to establish names by which to refer to the most important of them. The *tereticornis* group will be referred to again when the second part of this work is reached, which will deal with phylogenetic problems.

It is to be noted that the common name for *E. tereticornis* differs in New South Wales and Queensland. People here and there give other names, but in New South Wales the vast majority call it "Red Gum" and in Queensland "Blue Gum." At the same time the use of these names has been evolutionary; in New South Wales the names "Blue Gum" and "Grey Gum" for this species were both in use as late as half a century ago.

For example, this is the species referred to by Sir William Macarthur in his *Catalogue of Woods* at the Paris Exhibition, 1855 (No. 92), and the London Exhibition of 1862 (No. 19), as the "Blue Gum of Camden." In the catalogues of both exhibitions the native name in the Illawarra is given as "Tdjelat," or "Tjellat," and also "Barroul-goura," while in the latter catalogue the name is given as "Yarrah" at Camden. In this connection, the names given by George Caley (Botanical Collector in New South Wales, 1800-1810), as quoted in my paper in the *Agric. Gaz. N.S.W.* for 1903, p. 989, may be referred to. According to Caley's specimens, received from the British Museum, the names "Barilgora" or "Berigora" applied to *E. hemiphloia* F.v.M. are sufficiently near to those of Macarthur, to cause comment.

Caley gives the names of "Burringora" and "Yarro" for *E. tereticornis* and these have some similarity to those quoted by Macarthur half a century later. It is a matter for very great regret that the aboriginal names of our native trees were not systematically recorded, but, of course, very little was done with unravelling Eucalyptus in the early days. But the trouble could have been got over by collecting specimens and carefully numbering them; identifications would have followed in process of time.

SYNONYMS.

1. *Leptospermum umbellatum* Gærtner, *de Fructibus*, &c., i, 174, tab. xxxv.
2. *Metrosideros salicifolia* Solander (fide Gærtner); non Gærtner.
3. *E. populifolia* Desf. probably.
4. *E. subulata* A. Cunn., Schauer in *Walp. Rep.* ii, 924.
5. *E. insulana* F. M. Bailey.

3. *E. populifolia* Desf.

(a) Following is the original description :—

Eucalyptus populifolia.—Ramis lævibus; foliis petiolatis, alternis, cordato-orbiculatis, muticis et mucronulatis.

Facies *E. cordati* Labillardière; differt foliis petiolatis. Non floruit. Desf. (*Cat. Pl. Hort. Par.* ed. 3, 1829, p. 408.)

(b) It is next referred to in Walper's *Repertorium* ii, 927.

(c) Mueller refers to the name :—

“*Eucalyptus populnea* (*E. populifolia* Hook, in *Mitch. Trop. Austral.* p. 204, non Desfont.) (*Journ. Linn. Soc.* iii, 93).

(d) Mueller again refers to *E. populifolia* Desfont. in “*Eucalyptographia*” under *E. populifolia*.

In the journal above quoted (*Journ. Linn. Soc.* iii, 93), “I had changed the name of this species (*E. populifolia*, Hook.) to *E. populnea*, as Desfontaines had mentioned (*Catal. Hort. Paris*, 1829, p. 408), already an *Eucalyptus* under precisely the same name employed by Hooker.” (See Vol. iii, p. 93, of the present work.)

(e) Bentham (*B. Fl.* iii, 200) includes *E. populifolia* Desf. in a list of species he recommends to be entirely discarded. But our knowledge of individual species has advanced since then.

(f) Mr. James Britten, then of the Department of Botany of the British Museum, entered into correspondence with me on the subject early in 1900.

(g) In 1902 I received from the Vienna herbarium a twig, in juvenile foliage, labelled.—

“*Eucalyptus populifolia* Hort. Celsian. Ex horto dom. Cels. Parisiis 1820 sub. nom. indic. et *E. aromatica*.”

I understand this is Desfontaines' species, and it is *E. tereticornis* Sm. or close to it. This is as much as I can say, and I place the statement on record for what it is worth. In a few years I confidently expect that the determination of a species of *Eucalyptus* from a twig of juvenile foliage will present no difficulty.

4. *E. subulata* A. Cunn.

Arborea ramulis laxis angulatis; foll. coriaceis lanceolatis subfalcatis in petiolum attenuatis: longe acuminatis utrinq. pallidis opacisq. pellucido-punctatis, margine crassiusculo cinctis; pedunculis axillarib. lateralibq. ancipitib. petiolum subaequantib. 4-6 floris pedicellis angulatis cupula sub-triplo longiorib., operculo membranaceo supra basin contracto tereti-subulato cupula brevi cyathiformi quintuplo longiori. Foliorum lamina 3-5 poll., petiolus 9 lin., operculum 7 lin. par longum. In Nova Cambria australi. White Gum of Moreton Bay. (Schauer in Walper's *Repert.* ii, 924.)

"*Eucalyptus subulata* C. (Cunningham) near *E. resinifera*. White Gum of Moreton Bay, 50-60 feet, 1818."

The above label in Allan Cunningham's handwriting is in Herb. Cant., ex Herb. Lindl.

5. *E. insulana* F. M. Bailey in *Queensland Agric. Journ.* xvii, 103 (1906).

It forms bushes of 3 or 4 feet on elevated exposed situations, amongst grass-trees at Middle Percy Island, North Queensland. Branchlets prominently angular. Fruit not seen ripe. I have figured it at 5, Plate 129.

It comes from the same approximate locality as var. *latifolia* (Percy Island), and I look upon it as one of the many intermediate forms between it and normal *tereticornis*. It is a stunted plant, from an exposed situation. In my view it is impossible to maintain that it can be given specific rank. Indeed the describer stated that the name he gave was provisional.

E. Oldfieldii F.v.M., the Western Australian plant of which Bailey said it might be a form, is not closely related to it (see Vol. ii, p. 223 and plates 73 and 74). Indeed the species are very different as regards anthers, juvenile leaves, buds, fruit, &c.

Varieties.

1. Var. *latifolia* Benth. B. Fl. iii, 242.
2. Var. *brachycorys* Benth. B. Fl. iii, 242.
3. Var. *brevifolia* Benth. B. Fl. iii, 242.
4. Var. (?) *brevirostris* Benth. B. Fl. iii, 241.

1. Var. *latifolia*. Leaves ovate to lanceolate. Flowers with a strong cimicine smell. Shoalwater passage (North Queensland). R. Brown.

See a note by Deane and Maiden on *E. tereticornis* Sm. var. *latifolia* Benth. in *Proc. Linn. Soc. N.S.W.* xxiv, 469 (1899) with plate xli, fig. 9, consisting of a bead of fruits.

"Leaves ovate to lanceolate. Flowers with a strong cimicine smell." The only locality in the *Flora* for this variety is Shoalwater Passage, Queensland (R. Brown), but the variety, or at all events one of its numerous links with the normal species, is tolerably abundant in the coast and coast mountain districts of the Colony, both north and south of Port Jackson.

"Flowers with a strong cimicine smell" appears to give the clue to the name "Stinking Gum," which in some parts of the Colony is given to *E. tereticornis* (see *Agric. Gazette N.S.W.* 1898, 593), though in the specimens collected in the Mount Seaview district the leaves were not specially broad. It is, however, not likely that bad odour is a character exclusively possessed by the flowers of the variety.

These broad-leaved forms are usually (though not exclusively) found in swamps and flats, hence the local names "Swamp Gum," "Red Swamp Gum," and here we would point out that the habitat "Forest Red Gum" (*E. tereticornis*) as compared with "River Red Gum" (*E. rostrata*) is only generally and not absolutely true. This is an instance of the difficulty and even impossibility of giving entirely satisfactory vernacular names to many species of *Eucalyptus*.

We may point out that the timber of the broad-leaved forms is of very inferior quality (Mr. Forest Ranger Rudder, *Agric. Gazette* N.S.W., 1896, p. 15, says nearly worthless"), and this enables us to understand the conflicting statements sometimes published in regard to *E. tereticornis* timber, which normally is one of the most valuable timbers we have. As a general rule it may be stated that *Eucalyptus* timbers grown in moist situations are deficient in durability and strength.

The above note on var. *latifolia* refers in part both to var. *latifolia* Benth. and also to *E. amplifolia* Naudin; in other words, it goes beyond Bentham's definition.

As to *E. amplifolia*, see p. 19.

Var. *latifolia* Benth. can only be applied to certain coastal forms of central and northern Queensland, so far as our knowledge goes at present. It can be easily understood by reference to p. 11, and also to the figures on Plate 129.

2. Var. *brachycorys* Benth.

This is *E. punctata* DC. See Vol. iii (Part xxix) p. 194 of the present work.

3. Var. *brevifolia* Benth.

This is included in *E. Bancrofti* Maiden, and is figured and described in the present Part of this work. See figures 3 *a-d*, Plate 130, also page 15.

4. Var. (?) *brevirostris* Benth.

Bentham (B. Fl. iii, 241) refers to a variety *brevirostris*, which I have not seen. The full reference is:—

"*E. acuminata* Hook. in Mitch. *Trop. Austral.* 390, from the interior of Queensland, appears to be a variety of *E. rostrata*, with the operculum more conical and less rostrate, approaching the var. *brevirostris* of *E. tereticornis*." The plates of *E. tereticornis* show short operculumed forms, but it is idle to speculate, under the circumstances.

A variety *brevirostris* Mueller, of *E. longirostris* (*rostrata*), will be found referred to under *E. rostrata* in Part xxxiii.

RANGE.

It extends from east Gippsland (Victoria) from end to end of coastal New South Wales and Queensland, extending to Papua, being one of the few species occurring beyond Australia. Westerly it extends as far as the table-lands, but it prefers a sheltered situation when the elevation approaches 2,500 feet. Above that elevation it is usually replaced by one of the species kindred to it.

In the "Flora Australiensis" we have the range stated :—

Victoria.—Snowy River, Mitchell River, and Providence Ponds (Mueller).

New South Wales.—Port Jackson (Woolfs and others); "Bastard Box" (Woolfs). [I have never heard this name applied to this species. The late Rev. Dr. Woolfs arrived in Sydney in the thirties, when the names of trees were in a transition state, and some names which he heard tentatively applied dropped out in course of time. J.H.M.] Macleay and Hastings Rivers (Beckler); Clarence River (Wilcox); Richmond River (C. Moore).

Queensland.—Brisbane River, Moreton Bay (A. Cunningham); Keppel Bay, Broad Sound, Shoalwater (R. Brown); Percy Island (A. Cunningham); Port Denison (Fitzalan, Dallachy); "Red Gum and Blue Gum," Rockingham Bay (Dallachy); Bay of Inlets (Banks and Solander).

[At most of the northern localities, var. *latifolia* was the form collected].

Mueller in "Eucalyptographia" states the range thus :—

From the Gilbert and Burdekin Rivers (Queensland) to Gippsland (Victoria), ascending to New England, advancing inland to the Gwydir, and some other western streams of New South Wales, but never very far removed from littoral regions, traced already by R. Brown northward to the Northumberland Islands, occupying generally humid flats or growing around swamps and lakes or along watercourses, never on saline ground or saltwater streams.

As regards the Northumberland Islands, var. *latifolia* is referred to.

VICTORIA.

Mr. H. Hopkins states its range in this State in the following words :—

The best known and most valuable of our timbers—the Red Gum—is confined to the lower alluvial flats and river valleys, and in Gippsland is almost entirely confined to the river basins of the Latrobe, Thompson, Avon, Mitchell, Nicholson, and Tambo, and the alluvial deltas that lie between these rivers, and between the lakes and the foothills to the north. It extends inland along the valley of the Macalister River as far as Glenmaggie, but generally it does not extend beyond a comparatively short distance from the coast. Except for a few trees at Cunninghame, and two on the aboriginal reserve at Lake Tyers, there is no Red Gum in Gippsland east of the Tambo River. This species, however, is found further north in New South Wales in some of the river valleys running into the sea, and also in Queensland. The Murray River Red Gum (*E. rostrata*) is almost identical with the Gippsland species, differing only in some of the floral characteristics. The timber of the two varieties is indistinguishable, although the Gippsland Red Gum used to be considered the more durable. It is generally stated that the *E. rostrata* does not grow in Gippsland, but some two years ago I discovered a tree, undoubtedly of this species, growing on the bank of the Latrobe River near Sale.

Following are some specimens represented in the National Herbarium of New South Wales :—

Beechworth (A. W. Howitt); Chiltern (J. Staer).

Bell's Point, Metung, Gippsland (A. W. Howitt). The Victorian form of the species is quite normal. Mr. Howitt states that *E. tereticornis* is confined almost entirely to that part of Victoria; he has only observed it elsewhere in the extreme north-eastern district. He also observes that the forests of this species in Gippsland have suffered for thirty years from the attacks of larvæ of a moth which devour the upper and under surfaces of the leaves and thus ultimately kill the tree. "Whole forests for instance at Nimbin and Lindenow have within my knowledge been thus killed."

Similar attacks on this species have been observed in coastal New South Wales.

Following is a representative collection of herbarium specimens of this species, most carefully prepared by Mr. Harry Hopkins :—

Cunninghame (Lakes Entrance), Raymond Island, Bairnsdale, Heart Wharf, Lower Latrobe River; Swan Reach, Tambo River; Stratford, Briagolong. "Some years ago Briagolong furnished some of the best Red Gum timber in this country, but it is all cut out, or destroyed by ringing and clearing now." Lindenow Railway Station, Glengarry, Inverniechie School near Munro.

NEW SOUTH WALES.

Southern Localities.—It is found in the coastal districts of New South Wales, more or less plentifully, from south to north.

Bemboka (A. W. Howitt); Bega district (J. V. de Coque); Moruya (J. V. de Coque, W. Baeuerlen). "Rather narrow-leaved form." Harbour-road, Milton (R. H. Cambage, No. 4117); Shoalhaven River, near McCallum's Farm; also Diggers' Creek, with large fruits and broad rim (W. Forsyth and A. A. Hamilton).

"Blue Gum of Camden," exhibited by the late Sir William Macartbur with timber specimens under the numbers 19, 20, 21, at the Paris Exhibition of 1855. He gave the aboriginal names as "Tjellat" and "Barroulgoura" (Illawarra), and "Yarrah," Counties of Cumberland and Camden, which are of archæological interest, as the aborigines of those districts are now extinct.

Denham Court (T. V. Alkin) with very oval buds.

Goulburn, not normal, aff. *E. amplifolia* (Rev. J. W. Dwyer, 512).

Sydney District.—Common in the Outer Domain, and formerly in the Botanic Gardens and Inner Domain, where few trees now exist. It was formerly abundant on the site of the city of Sydney, and in the suburbs generally.

Como (J. H. Camfield); Parramatta Park (H. Deane).

Caley collected it often in the Sydney and Parramatta district, particularly the latter, where his residence was.

(a) "Picked up beyond Aiken's Creek, 16th Jan., 1807. Perhaps a sort of 'Yerre.' It can be no other than 'Torumba.'"

(b) "Bastard Blue Gum. The same as the specimen of wood. 8th June, 1804." Caley also collected a large number of specimens of Eucalyptus woods (See my "Sir Joseph Banks: the Father of Australia," p. 139), but they were not permanently preserved. Had the Eucalyptus collections and notes of Robert Brown and Caley been published during their lifetimes our knowledge of the genus would have been advanced more than half a century.

Western localities.—Sydney to the foot of the Blue Mountains.

Lower Castlereagh (Richmond to Penrith) (R. Farlow); Kanimbla Valley, via Mt. Victoria. Just past bridge over creek at foot of hill leading to Vickery's Station; also in the yard of the homestead (J.H.M.); Rylstone (R. T. Baker); Capertee (J. L. Boorman, J.H.M.).

Northern localities.—"Flooded" or Red Gum." Cooranbong (Forest Ranger Martin).

" 'White or Ribbon Gum.' Specimens with leaves of normal width, but those from a young tree fruiting in the broadly-lanceolate stage. Fruits with a very broad rim. It is often the case that the leaves from young, vigorous trees have leaves very much broader than those from older ones." Large tree, alluvial, Myall River (A. Rudder).

Glaucous buds, and leaves rather broad. Minembah, Whittingham, near Singleton (J.H.M.).

Young branchlets winged as is sometimes seen in *E. amplifolia*. Buds glaucous and some leaves reminiscent of the preceding specimen, but some leaves narrow-lanceolate; fruit with a rounded or domed rim. Williams River (J. L. Boorman).

"Narrow-leaved variety of *tereticornis* not the best" (referring to the quality of the timber). This form has the usual narrow lanceolate leaves and has rather short conical opercula. Underbank, Upper Williams River, *via* Dungog (A. Rudder, M. 2).

Height 50 feet, diameter 1 ft. 6 in. With broadly-lanceolate, glaucous foliage, angular branchlets and sharp-rimmed fruits. At first sight a very distinct form, but it shows transit to *E. Bancrofti*, and other allied species. In clayey or rocky soil, Ph. Uffington, Dungog district. (A. Rudder, G. 12).

"Narrow-leaf form, timber very durable." Stroud district (A. Rudder).

Height 140 feet, diameter 3 feet. Black loam. Near Gloucester (A. Rudder). Gloucester (W. Heron).

Spotted bark. On top of hill from Murrurundi, on road approaching Ardglenn. Leaves broadish, some triplinerved. Shows affinities to *E. Bancrofti*. (J.H.M. and J. L. Boorman). "Grey Gum." Murrurundi Common (L. A. Macqueen, Forest Guard, No. 4). Murrurundi is on the Page River.

"White Gum." An interesting specimen with angled calyx-tubes and showing decided affinity in the buds to *E. Bancrofti*. Waverley Station, Page River (L. A. Macqueen, Forest Guard). Denman (W. Heron, No. 21).

Scone: also Page River (J.H.M.). With small buds. Stewart's Brook, Upper Hunter (J.H.M.). Upper Hunter (Backhouse, No. 8), from Kew Herbarium. In half-grown glaucous bud, showing marked rim indicating double operculum. Nundle (J.H.M., J. L. Boorman).

"Slaty Gum," 'because very glaucous.' A small irregular tree flowering in the juvenile leaf stage as well as in the stage with normal mature leaves." Taree (E. H. F. Swain).

"Slaty Gum." "Smooth bark like Stinking Gum," see p. 23. Gloucester-road, Port Macquarie (Forest Ranger G. R. Brown, No. 442). Port Macquarie (G. R. Brown, J.H.M.). "Red Gum," Beechwood, Rolland's Plains (J. L. Boorman). "Stinking Gum." Foot of ascent to tableland, Port Macquarie to Walcha (J.H.M.).

Macleay River (Dr. H. Beckler). Trial Bay (J. L. Boorman.)

"Red Gum," bark white and smooth. East slopes, New England to Macleay (A. R. Crawford).

Timber very hard, heavy, and lasting, often quite unwedgeable, apt frequently to shell off when being split, pieces of the curled butts often are very pretty when planed. Until very recently I have not known this timber touched by the white ant, but twelve months ago I noticed one or two cases on the Tableland. I have seen a little of both dry rot and white ants in this timber at Cunderang on the Eastern Slopes. I saw, about twelve months ago, some Red Gum posts lifted; they had been put up for a horse paddock when the place was first formed, I think by Hughes and Hoskins about 1842 or 1843. Although the posts could never have been more than about 2 inches at the upper end, and, say, 4 inches at the ground, the post, except for sun cracks, was as sound as when first erected. At the new station there a tree of this species was burnt down when preparing for cultivation paddock; it was 9 feet in diameter; I saw it measured but did not see the height taken; it was said to be 50 feet to the first branch; it had no pipe in it. (A. Crawford, Moona Plains, Walcha, *in litt.*)

Coff's Harbour (A. H. Lawrence).

"A small tree about 35 feet high. Shaggy box bark to 4 feet, smooth purple with grey patches the rest. In low grass country, clay, 1 mile from the sea." Woolgoolga (E. H. F. Swain, No. 48).

"Red Gum," Lawrence, Clarence River (J. V. de Coque). "Grey Gum," Grafton (E. J. Hadley, No. 43). Woodford Island, Clarence River (E. J. Hadley, No. 17). Susan Island, Clarence River (J. L. Boorman). "Tall robust trees of 50 to 60 feet, with large clean stems. Yield large quantity of sound timber. Grows principally in the low-lying places of the district." Fruits very domed. Copmanhurst, Clarence River (J. L. Boorman).

"Forest Red Gum." Rappville, on the railway line, 17 miles from Casino (C. L. Campbell). (Buds aborted by dipteron belonging to Family Agromyzidae). Casino, also a specimen with purple filaments. (W. F. Pope). Coraki to Casino (J. H. M.). Upper Richmond River (W. Forsyth).

Tintenbar. "Flowers on upper part of tree all pink." (W. Baeuerlen).

"Red Gum." "Large trees fairly plentiful in the locality. One of the most durable timbers we have for wheelwrights' work, wood blocks, &c. It grows in the vicinity of swamps. It is an open forest wood and is of the same habit as Murray Red Gum (*E. rostrata*). Acacia Creek, Macpherson Range (W. Dunu).

Following are some drier areas :—

Baan Baa (J. L. Boorman).

"40 feet high, 80 inches in girth. Smooth, slaty, spotted bark." T.S.R. 4355, Ph. Bomera, Co. Pottinger (M. H. Simon, Forest Guard, No. 33).

Bingara to Warialda (J. H. M. and J. L. Boorman). "Red Gum." Wallangra (J. L. Boorman).

Following are New England localities :—

"Red Gum." Armidale. (District Forester Stopford). Tent Hill, Emmaville. (J. L. Boorman).

Red Gum or Grey Gum (*E. tereticornis*) occurs in the Glen Innes to Tenterfield district, but there are not many trees from which sleepers could be got (H. Deane, 22nd September, 1885). Near Tenterfield. (H. Deane). Very glaucous buds. Connects with *E. Bancrofti*.

"Red Gum." Tall trees yielding good mill-logs, being sound and comparatively free from branches. Not normal; some fruits banded and showing affinity, in this respect, to *E. Bancrofti*. Wallangarra, New South Wales-Queensland railway border (J. L. Boorman).

QUEENSLAND.

Goondiwindi (R. B. McIntyre); Roma (Joseph Mayfield; Gowrie, Little Plain (W. F. Gray). Dalveen, near Tenterfield, N.S.W. (A. Sargent). Killarney (J. L. Boorman). Killarney South (E. S. Taylor) (near the Macpherson Range, N.S.W., noted above). Leyburn (A. E. A. McCahon). Warwick (Dr. J. Shirley). Doctor's Creek, *via* Toowoomba (Orlando Bartlett). North Toowoomba (Miss Florence E. Yardley). Rangeville (Thomas Henderson). Gatton (Major Fowles). Hatton Vale, Laidley (W. H. Pimlott). Newtown, Ipswich (J. Spencely). "Grey Gum," Brisbane district (Dr. J. Shirley). Stradbroke Island (F. M. Bailey). Moreton Bay (Allan Cunningham, collected 1828). "Blue Gum." Burpengary, Deception Bay (Dr. T. L. Bancroft). Caboolture (P. H. McGurk). Apsley (E. Filbrough).

Following are some South Queensland localities :—

"Scaly Gum at Mr. Macosson's" (Dr. Leichhardt, 29th March, 1843). "Gum tree, Mr. Booker's Station" (Dr. Leichhardt, 1st April, 1843). "Archer's Station" (Bunya Bunya) (Dr. Leichhardt, 17th August, 1843). [See Dr. Lang's "Cook'sland," p. 83.]

Gympie (L. Hirst). Maryborough West (P. J. McGrath). "Blue Gum." Fraser Island (W. R. Petrie, No. 9). Bundaberg (J. L. Boorman). Calliope (Clifford Curtis). St. Lawrence (Thos. Tate). Blackdown Tableland, near Dingo, 90 miles west of Rockhampton (R. N. Jolly). Upper Dawson-road, near Rockhampton (W. N. Jaggard). Crescent Lagoon, West Rockhampton (W. N. Jaggard). Rockhampton (R. H. Cambage, No. 3991). Rockhampton, very broad rims (J.H.M.). Rockhampton, broadish leaves, connecting with var. *latifolia* (R. Simmons). Rockhampton district (Amalia Dietrich, 1865, Nos. 424, 2220). Mt. Morgan (C. F. Henrickson). East of Rockhampton, near the sea-coast (P. MacMahon). "A fairly common tree throughout the coastal districts of Queensland, chiefly on flats and in moist situations." Yeppoon, near Rockhampton (J. L. Boorman).

"Blue Gum." Throughout the northern tablelands. Tall tree, perpendicular branches, dark blue-grey outer bark frequently peeling. Near Atherton (H. W. Mocatta, District Forest Inspector).

"Northumberland Isles." Coll. 1802-5. (Robert Brown, No. 4737).

Charters Towers (H. B. Walker). Herbert River (correspondent of Mueller). Endeavour River (Persieh).

PAPUA.

Astrolabe Range (F. H. Brown).

Var. *latifolia* Benth.

Robert Brown's *Iter Australiense* 1802-5 (No. 4737, Northumberland Islands, and 4,738, Shoalwater Bay Passage). This is the type of var. *latifolia* Benth., with plump, oval buds.

Port Mackay (Amalia Dietrich), showing transit to normal *tereticornis*. Percy Island (Allan Cunningham in "Captain P. P. King's Expedition." Herbert River. "Endeavour River from the Earl of Mount Morris, ex herb. Lambert," in herb. Cant. With very broad rims to fruits.

Keepkie's Dairy, Crescent Lagoon, West Rockhampton (W. N. Jaggard). "Blue Gum." "Large seeded *tereticornis*." Grows in low, flat country, Rockhampton (A. Murphy). A careful collection of forms in the Rockhampton district, allied to *E. tereticornis*, should be made. Mr. Murphy, when collecting "north of Rockhampton," sent a "Large seed Blue Gum" with broadly-lanceolate mature leaves, ovate to nearly circular mature leaves, and not perfectly mature fruits, with rather long pedicels. The fruits are of medium size, slightly urceolate, nearly hemispherical and inclined to be flat-rimmed.

AFFINITIES.

1. With *E. rostrata* Schlecht.

The closest affinity of *E. tereticornis* Sm. is to *E. rostrata* Schlecht., in fact they run into each other as do so many species in this genus; at the same time it would be highly inconvenient in practice not to separate them.

The late Rev. J. E. Tenison-Woods expressed the opinion (*Proc. Linn. Soc. N.S.W.* VII, 331), that *E. rostrata* and *E. tereticornis* are specifically identical. Baron von Mueller ("Eucalyptographia," under *E. rostrata*), says . . . "indeed from a strictly phytographic view it should be considered merely a variety of *E. tereticornis*, but for convenience sake and practical purposes the specific name may well be retained for so important a tree as this." The species are undoubtedly closely related; *E. tereticornis* usually grows in drier situations than does *E. rostrata*, while the operculum of *E. tereticornis* is usually sufficiently distinct in appearance from the pinched or beaked appearance of that of *E. rostrata*. *E. tereticornis* in one of its forms grows, as we have already seen, in swampy localities, and sometimes the shape of the operculum is not too safe a criterion to go by. For example the "Water Gum" or "Creek Gum" (*E. rostrata*) of the Burrowa district, N.S.W., is not constant in form. We have (1) Comparatively large nearly hemispherical fruits and the typical opercula. (2) Specimens scarcely differing from the *rostrata* of the interior. Then we have, growing but a few yards from the preceding, trees whose fruits I find it impossible to separate from (2). Extreme forms of the fruits of *E. rostrata* and *E. tereticornis* are sufficiently distinct, but these are identical. The pedicels are filiform and the opercula are pinched, but intermediate in form between typical *tereticornis* and typical *rostrata*. I have placed this with *E. tereticornis* as I have to place it somewhere, but it equally belongs to *rostrata*, and I repeat I cannot find any character in these specimens which shows that it belongs more to the one than the other. In other words, it is a link in the grand *tereticornis-rostrata* species.

In a report to the Victorian Government Mr. A. W. Howitt says: "The Red Gum, as I have noted, is of two varieties which are distinguishable by slight botanical differences and by the usually larger size of the leaves of seedlings and young saplings in the Gippsland form (*E. tereticornis*). I have placed this first because I have reason to believe that the timber is harder and denser than that of the Murray River Red Gum (*E. rostrata*). The Gippsland Red Gum is confined almost entirely to that part of the colony; I have only observed it elsewhere in the extreme north-eastern district. The Murray River Red Gum is spread over the remainder of the colony, excepting in the higher ranges and on certain coast tracts."

There is no doubt that in many cases where *E. tereticornis* and *E. rostrata* grow in the same district, the timber of the former is superior to that of the latter. As a practical instance of this Mr. A. C. Mountain, City Surveyor of Melbourne, informed me that he will not use Murray Red Gum for paving; he must have Gippsland Red Gum. This is in accordance with the law that very largely holds good—that timber grown in a moist locality is inferior to that grown in a drier locality. *Vice versa*, in regard to the comparative value of the timber of *E. tereticornis* and *E. rostrata*, those forms of *E. tereticornis* growing in damp situations (e.g., the Swamp Gum with small fruits and broad leaves), have timber decidedly inferior in value to that of *E. rostrata*. (Maiden in *Bull. de l'Herbier Boissier*, Seconde Série, ii, p. 578, 1902.)

I have republished my observations of fifteen years ago as I think they will be useful, and they require little amendment to-day. The "Swamp Gum" of the last sentence is *E. amplifolia* Naudin.

E. rostrata will be dealt with in Part xxxiii and in both Parts xxxi and xxxii are a number of species closely allied to *E. tereticornis*, and therefore to *E. rostrata*.

2. With *E. resinifera* Sm.

The common form (of *E. tereticornis*) with a long operculum, when in very young bud, requires some caution in distinguishing it from the rostrate varieties of *E. siderophloia* and *E. resinifera*. The venation of the leaf is then the best guide. (B. Fl. iii, 242.)

In the old collections a number of cases occur in which *E. tereticornis* is labelled *E. resinifera*. Following is an instance:—

"*Eucalyptus resinifera*, H.B.C., from New Holland," in Herb. Cant., ex Herb. Lindl. In the above label "H.B.C." probably indicated "Herb. Cunninghamham." Loudon and other old authors depict *E. tereticornis* under the name *E. resinifera*.

As to the similarities between *E. resinifera* and *E. tereticornis*, reference may be made to p. 213, Part XXX, and to figures in Plates 124 and 125. Sometimes the opercula of the two species are so much alike as to necessitate caution, but the leaves of *E. resinifera* have finer and more uniformly parallel veins than those of *E. tereticornis*, while *E. resinifera* has a thick, fibrous bark, and *E. tereticornis* a smooth one. The confusion of the old botanists arose from herbarium specimens, which were rarely accompanied by notes on the habit of the tree, &c.

3. With *E. punctata* DC.

It has already been observed, p. 5 of the present Part, and p. 196 of Part XXIX, that *E. punctata* DC. is synonymous with *E. tereticornis* Sm. var. *brachycorys* Benth.

Both are erect trees, *E. punctata* being the more erect of the two. The former has, however, that sand-papery surface of the bark, already described (p. 195), which is at once seen to be different to the smoother and more shiny bark of *E. tereticornis*.

Reference to Plates 121 and 122 will show that the opercula of *E. punctata* are shorter (indicated in Bentham's name *brachycorys*), and, as a very general rule, the fruit of *E. punctata* is quite different, being cylindroid, but on rare occasions the shapes of the fruits in the two species more closely approach each other.

4. With *E. Kirtoniana* F.v.M.

For an account of *E. Kirtoniana*, see Part XXIX and Plate 123. At p. 204 is a reference to the statement that Mr. R. T. Baker placed *E. Kirtoniana* (*patentinervis*) between *E. tereticornis* and *E. rudis* Endl., two nearly smooth-barked species, that of *E. Kirtoniana* being decidedly rough, something intermediate, in that respect, between Bloodwood (*E. corymbosa*) and Swamp Mahogany (*E. robusta*). *E. tereticornis* is erect in habit, *E. Kirtoniana* is much less so.

Mr. W. F. Petrie (p. 202) points out certain affinities to *E. tereticornis*, but this applies chiefly to the foliage, for if one were to turn to Plate 123 and note the buds and fruits, it will be seen that there is but little resemblance.

5. With *E. siderophloia* Benth.

This is referred to in Vol. i (Part X) p. 329; compare also certain figures in Plate 47.

DESCRIPTION.

CLIX. *E. Bancrofti* Maiden.

IN Maiden's *Forest Flora of New South Wales*, Part XI (Vol. ii) p. 9 (September, 1904), excluding the Burpengary references.

A TREE of medium size, with sparse foliage; usually crooked and gnarled, bark smooth, falling away in irregular patches; timber dark reddish brown. Very similar in appearance to *Angophora lanceolata*.

Juvenile leaves.—Dull on both sides, very broadly lanceolate to nearly ovate, but not seen in the earliest state.

Mature leaves.—Dull on both sides, lanceolate to broadly lanceolate, very acuminate, falcate, sometimes oblique, with a long, somewhat twisted petiole. The veins numerous, oblique, roughly parallel, not prominent, the intramarginal vein at no great distance from the edge.

Buds.—The calyx-tube with usually two angles, and rather abruptly terminating in a rather broad, angled pedicel. The operculum nearly cylindrical, rounded or blunt at the top, and nearly twice as long as the calyx-tube. The operculum enveloped in an outer operculum, early deciduous, which leaves a well-marked rim at its junction with the calyx-tube, giving the bud an appearance to which the homely term "egg-in-egg-cup" has been applied.

Flowers.—Up to seven in an umbel, which is supported on a thickish, flattish petiole of 2 cm. Filaments versatile on a parallel-celled anther; a rather large gland at the back near the top.

Fruits.—Nearly spherical in general outline, up to 1 cm. in diameter, domed, with a broad band, tips of the valves well exsert, pedicels short and thick.

Type from Honeysuckle Flat, about 9 miles south of Port Macquarie, N.S.W., on serpentine country bearing stunted vegetation (J. H. Maiden, July, 1895). (J. L. Boorman, November, 1915, co-type). Locally known as "Orange Gum."

In honour of Dr. Thomas Lane Bancroft, who has supplied me with complete suites of specimens and valuable information concerning several Queensland Eucalypts.

As maturity approaches, the trunk is often hollow, with large cavities more or less filled with a thin brownish astringent liquid which, at certain seasons, requires care on the part of the feller as it sometimes squirts out with great force.

The outstanding character of this species is the blunt operculum. In the table-land specimens, all have blunt opercula, with the exception that at Stanthorpe (Q.) and at Emmaville and Tingha, there is some elongation and pointing of that organ, but these are obviously only aberrant forms.

Coming to the coast, the Camden Haven specimens have long opercula, but these, again, are obviously aberrant.

As regards the leaves, the table-lands specimens are in their typical form (var. *brevifolia*, Benth., New England) short and blunt, though with some tendency to be lanceolate, and in a number of the tablelands specimens lanceolate leaves are common, though the general tendency is to be short.

In the coastal specimens the leaves are uniformly lanceolate, and in some cases very long (e.g., Woolgoolga).

So that we have :—

1. Blunt opercula and blunt short leaves 2–3 inches long (*E. tereticornis* var. *brevifolia*) from New England and elsewhere.
2. Blunt opercula and long leaves (6–7 inches). (Orange Gum of Port Macquarie, type of *E. Bancrofti*); also Woolgoolga up to 12 inches.
3. Long opercula and leaves intermediate in length (e.g., Emmaville).

Other instances of variation can be cited from the specimens about to be enumerated, and also from Plates 129–131.

Examination was made to see if the table-lands specimens constituted a form distinct from that of the coast, but the distinctions hardly seem sufficiently marked.

E. Bancrofti, over all its range, whether on the granite of New England and the Monaro, or in coastal swamps, is a depauperate tree usually described as “Tumble-Down Gum.” In the former localities it is a denizen of hungry soil, in the latter the bog-water, often ferruginous, is physiologically unsatisfying. It is a form, therefore, that has accommodated itself to very hard conditions, and variation has been stimulated.

SYNONYMS.

1. *E. tereticornis* Sm., var. *brevifolia* Benth.
 2. *E. tereticornis* Sm., var. *amblycorys* F.v.M., in part.
 3. *E. tereticornis* Sm., var. *Bancrofti* Maiden.
1. *E. tereticornis* Sm. var. *brevifolia* Benth. B. Fl. iii, 242. “Leaves mostly ovate or oblong, obtuse. New England, in very exposed situations in the mountains.”—C. Stuart. See p. 16.
 2. *E. tereticornis* Sm. var. *amblycorys* F.v.M. Specimens of the New England form of *E. Bancrofti* (*E. brevifolia* Benth.) have been extensively distributed by Mueller under the MSS. name of var. *amblycorys*. *Amblus*—blunt, *corys*—a helmet (operculum). *E. Parramattensis* C. Hall (see Part XXXII), has been less extensively distributed under the same name.
 3. *E. tereticornis* Sm. var. *Bancrofti* Maiden, in *Forest Flora of N.S.W.*, ii, 9.

RANGE.

The range of this species, as far as is known at present, is remarkable. Its most southerly locality is on the Monaro, a portion of the great southern table-land, at Cooma, about 60 miles from the Victorian border, at an elevation of 2,700 feet.

Proceeding north, after several hundred miles, we ascend New England reaching as far as Stanthorpe in Queensland (under 3,000 feet), and also find the species in a number of places on the western slopes of New England.

Coming to the coast, the most southerly locality we have it from is Camden Haven, a little south of Port Macquarie, and thence, going north, it occurs as far north as Woolgoolga in the Grafton district. We do not know its north coastal range precisely, and, bearing in mind the gap between the table-lands and the coast, it is quite evident that we have much to learn in regard to intermediate localities.

The matter of transition forms will be referred to below.

NEW SOUTH WALES.

Southern Tableland.—Following Cooma Creek at the back of the Gaol, Cooma, "A tumble-down gum, like the same species found at Emmaville, Wallangarra, &c." (J. L. Boorman.) Figured at figure 1, Plate 131, with blunt opercula, and leaves.

This locality is remarkable, as we do not know this form nearer than at least 350 miles to the north as the crow flies. Intervening localities, probably on mountain-tops, should be looked for.

Northern Tableland.—"From most exposed parts of the mountains at 1500–2000 feet. (N.B.—the heights were not generally known in Stuart's days, and these figures should be nearly doubled.—J.H.M.). A straggling tree, 20–30 feet, with very smooth white bark, separating in thin scales." New England. (Charles Stuart, No. 127). Labelled by Mueller "*E. tereticornis* Sm. var. *amblycorys* F.v.M." It is the var. *brevifolia* of Bentham (B. Fl. iii, 242), with short, blunt leaves.

On another specimen (No. 308) also from ("New England, 1500 feet.") Stuart writes: "A large tree, but frequently flowering very young." The leaves are lanceolate, but otherwise like No. 127. Opercula blunt.

The rim of the calyx in this Gum is very marked. The valves are well exerted and pale. The operculum and calyx are full of oil dots. The leaves are dull, the veins are finer and less prominent than that of *E. tereticornis*; the intramarginal vein is usually not so far distant. The peduncles are much broader and flatter than in *E. tereticornis*; the pedicels likewise are broader and flatter. The operculum is sub-cylindrical, much longer than the calyx, but the calyx is larger and the operculum smaller than in the normal species. The operculum is narrower than the calyx, giving the appearance of "egg-in-egg-cup" or acorn and cup. This shape is very marked. The pedicels are flat and thick. The whole fruit is coarser in appearance than is that of *E. tereticornis*.

Mr. J. L. Boorman and I found this form at Jennings, on the New South Wales-Queensland border. It is a large scrambling tree, growing amongst masses of granite; branches rather rotten; fruits broad-rimmed. It is in every way similar to Charles Stuart's specimens, both Nos. 127 and 308.

Mr. Boorman found trees at Emmaville, which he thus described: "Large trees growing throughout the district with a patchy bark (after the fashion of *E. punctata*), leaves long, glaucous; suckers, ovate to oblong; buds, long cylindrical, but rather pointed; fruits, with prominent valves." The specimens seen by me have the leaves for the most part small and short, the opercula longish and pointed. Emmaville (J. L. Boorman).

The same form, as Emmaville, has been found by Mr. R. H. Cambage at Tingha. The buds, while the calyx is still of greater diameter than the operculum, have the operculum as long as that of *E. amplifolia* Naudin (Swamp Gum). Some of the opercula are blunt. (R. H. Cambage, No. 1007).

Howell, near Tingha and Inverell, with large, lanceolate leaves. Opercula blunt. (J.H.M., J. L. Boorman).

"Large trees having a bluish white stem, with irregular patches of bark adhering, showing a mottled stem. Stems large, containing abundance of good timber, the principal sort in the district. In flats of a rich alluvial character." Guyra (J. L. Boorman).

Forest Reserve 35,664. Ph. Ironbark, Barraba-Bundarra. Leaves becoming lanceolate; opercula blunt. (W. A. W. de Beuzeville.)

Ph. Terrerree, Co. Courallie. With lanceolate leaves. No opercula. (E. H. F. Swain.)

Mount Lindsay Station, 3200 feet, Nandewar Mountains. Like both 127 and 308, as regards the leaves, and also the blunt opercula. (R. H. Cambage, No. 2355).

"White Gum" Warialda. Leaves lanceolate. Opercula blunt (W. A. W. de Beuzeville).

QUEENSLAND.

Stanthorpe, Queensland, with lanceolate leaves, opercula blunt, and also beginning to be elongated. (Rev. J. H. Simmonds).

NEW SOUTH WALES.

It will now be convenient to follow the species along the coast of New South Wales.

Coastal localities.—"Orange Gum." "Grows in swampy localities." Kew. Camden Haven (J. T. Moore, Acting Assistant Forester). Lanceolate leaves, elongated opercula, smallish fruits. The buds have elongated opercula, and the fruits more closely resemble those of *E. tereticornis* than those of *E. Bancrofti*. In a word, this form shows transit between the two species named, though it is closest to *E. Bancrofti*, and indeed, belongs to that species.

Then we come to the "Orange Gum," growing on ironstone and serpentine soil at Honeysuckle Flat, Port Macquarie. There are a few hundred trees, attaining no great size—say, 18 inches to 2 feet in diameter, 12 feet to first fork, and 30 feet high.

Timber, very deep red, especially when freshly cut; brittle, usually hollow, and the timber looked upon as inferior. The buds are precisely those of Stuart's New England specimens, the fruits nearly so, while the leaves are 6 inches long. (J. H. M. coll. 1895). The type.

"My Orange Gum," so wrote Mr. Brown, Port Macquarie district (Forest Ranger G. R. Brown, 1892), but not the Orange Gum of Kew, Camden Haven, in every detail, though, in my opinion, conspecific.

Coff's Harbour (Forester A. H. Lawrence). Precisely similar to the Serpentine (Port Macquarie) type specimens.

Half-way Beach, near Woolgoolga, on poor swampy soil, with very coarse foliage. With leaves up to nearly a foot long, and 2 inches wide (E. H. F. Swain).

AFFINITIES.

I have already pointed out the gaps in the distribution of this species, and when we have collected and observed more, both as regards this species and others which have been carved by others and myself out of *E. tereticornis*, we shall be in a better position to indicate their infinite ramifications and affinities.

1. With *E. tereticornis* Sm.

This is the species to which it is closely allied, but when they grow near each other they can always be separated.

E. tereticornis is a tallish tree of rather erect habit; *E. Bancrofti* is a scrambling, gouty-looking tree with the habit of *Angophora lanceolata*. The latter species has become accustomed to an environment of swampy, sour land; *E. tereticornis* prefers drier situations, and although it will grow on the banks of streams, it flourishes only in situations which are fairly well drained.

The foliage of *E. Bancrofti* is duller and has the venation less marked; the opercula are usually shorter and more rounded; those from mountain localities are commonly glaucous. *E. tereticornis*, particularly in its variety *latifolia*, may have comparatively short and rounded opercula, but the line of demarcation between calyx tube and operculum is never so accentuated as in *E. Bancrofti*.

The fruit of *E. Bancrofti* is usually larger and more rounded, and the banded rim is wider.

Further differences are indicated in the references to var. *brevifolia*, ante p. 16.

The left-hand twig depicted in the plate of *E. tereticornis* in the "Eucalyptographia" is *E. Bancrofti*.

2. With *E. Seeana* Maiden.

See that species in Part XXXII.

DESCRIPTION.

CLX. *E. amplifolia* Naudin.

IN "Description et emploi des Eucalyptus introduits en Europe," &c. (2nd Mémoire).
• Antibes, p. 28 (1891).

FOLLOWING is a translation of the original :—

Large tree, to be classed in the "Uniform Alternifoliate" Section, although it differs much in the early stage from the form it will take in the adult one. By its mode of inflorescence, the relative length of the opercula, and the structure of its fruit, it belongs to the intricate group of species and varieties of which *E. tereticornis* may perhaps be considered the centre, but at the same time it has characters so peculiar, that one can only look upon it as a good species.

I have found it in many places in Algeria, in our Provence gardens, in that of Mr. Hanbury, at Mortola, near Mentone; I have received specimens from M. Ricasoli of Florence, and we possess several specimens of it of different ages at the Villa Thuret. Everywhere this Eucalypt is seen to be very uniform, which is an additional argument in favour of its specific recognition.

One of the good characters which make it recognisable from its earliest age is the magnitude and shape of its leaves, petiolate and alternate, very largely oval-obtuse or even orbicular, and of a size that may be called exceptional in the genus, for some are found to be from 10–12 cm. long and almost equally broad. In the adult age they vary considerably; sometimes they are oval, but not so large as those of the juvenile phase; sometimes, and more often, they are lanceolate, more or less curved, 15–20 cm. long and of a width varying from 2–5 cm. These leaves, as well as those of the early stage are green, slightly glossy and coriaceous.

There is more uniformity in the inflorescence which is in axillary umbels which have usually a peduncle shorter than the petiole of the adjacent leaf. They are many-flowered, containing usually from 13–15 flowers, shortly pedicellate, of which the operculum (which is nearly four times as long as the tube of the calyx) is conical-pointed, straight or slightly curved. The fruit, which is scarcely the size of a very small pea, is spherical, but apiculate, the prolongation of the exsert capsule, the valves of which, when brought together, form a point. When mature they open out, leaving the fruit gaping as in the other species of the same group. The capsule is 3–4 celled.

E. amplifolia is one of the species which are remarkable for rapidity of growth. Its stem rises straight, and the tree naturally takes the pyramidal form. The trunk becomes smooth and of a greyish shade when the first bark is detached from it.

By the shape of the fruit, *E. amplifolia* resembles *E. capitellata* Smith, figured in Mueller's "Eucalyptographia," but it differs from it considerably in its juvenile stage, and further, perhaps, by the length and the form of the opercula of the flowers, those of *E. capitellata* being reduced to a little rounded and obtuse cap, much shorter than the calyx tube. It has more analogy with *E. macrorrhyncha*, which is distinguished from it by its juvenile form, by its usually seven-flowered umbels, and by the relative shortness of the opercula, which are here of the same length as the calyx tube. To judge by the figure in the "Eucalyptographia," the fruit would be as much larger as that of *E. amplifolia*.

A specimen in fruit in Herb. Mus., Paris, bears the following label in M. Naudin's handwriting :—

"*Eucalyptus amplifolia* Ndn. Du bois de Boulogne d'Alger, administration forestière. Ch. Ndn."

A second specimen in young foliage bears the label :—

“ *Eucalyptus amplifolia* Naud. Cultivé à Cannes, M. Naudin.”

A third specimen; evidently belonging to the second, bears the following label in M. Naudin's handwriting, together with a sketch :—

“ *Eucalyptus amplifolia*, Ndn. Jardin du Rion, à Cannes, 14 Septembre, 1880, Ch. Ndn. Ombelles de 7 à 9 fleurs et quelque-fois plus atténuées en un court pédicelle-pedoncle commun plus court que le pétiole. Arbrisseau, feuilles coriacés, très grandes. Opercule des boutons, conique ou cornu, plus long que le tube du calyce. Non *E. platyphylla* Benth.”

These specimens were lent to me by M. Jules Poisson, and they are quite characteristic. Before returning them to Paris, Miss Flockton made excellent drawings of them, from which were selected the small sketches, figures 2a, b, c, d, in Plate 131.

It will thus be seen that the species was founded on specimens cultivated in France; they match absolutely a number of specimens in the National Herbarium, in the Bankstown and Cabramatta districts, near Sydney, Bowral to Goulburn in the south, and indeed, many other localities both south and north, for it is a very well-defined species.

Mr. Theodore Payne of Los Angeles, California, U.S.A., informs me that it is locally known as the “Cooper variety of *E. tereticornis*,” as the old trees are on the Ellwood Cooper ranch, Santa Barbara, California, and all the other Californian trees can be traced to this source. He adds: “When young, the seedlings have a large, almost round leaf, and very square stems. The lower branches of the young trees often retain this round leaf for several years.”

The specimens Mr. Payne sent have very short pedicels, and closely conform to the type.

E. amplifolia is not a big tree as a rule; it is usually a denizen of swamps, and when occurring on the sides of hills, there is probably subterranean water. It has a comparatively soft timber, which is stated to be usually inferior in quality. The juvenile foliage is very coarse, and the branchlets quadrangular.

Its flowers are sessile or with very short pedicels; often many in the head, at least up to twenty-one, although only up to fifteen in the type. They are sometimes arranged in a stellate manner. There is often a double operculum on each bud, the outer one paler. In consequence of the double operculum the calyx tube is of greater diameter than the operculum. Often the operculum is curved.

The fruit is small and domed, with the valves much exsert, and often taking on an incurved or clawed appearance.

It often flowers in the sapling stage, *i.e.*, when quite small.

In 1904 I wrote of this species :—

E. AMPLIFOLIA, Naudin, 2nd Mém. p. 23; these Proceedings, 1903, p. 893.

E. tereticornis Sm., non var. *latifolia* Benth., B.Fl. iii, 242. Suggested that it might perhaps be a form of var. *latifolia* Benth., by Maiden in "Bull. Herb. Boissier," 1902, p. 571; "Forest Flora, New South Wales," Part xi, p. 7.

I am satisfied that this "Swamp Gum" or "Broad-leaf Blue Gum" is a distinct species. In its commonest form it is a small or medium-sized tree, inclined to a crooked stem and scrambling branches, with long, narrow, horned or, tapering opercula (the arrangement of the buds is usually stellate), and small fruit, the valves well exerted and numerous in the head. It is common in damp situations in Eastern New South Wales and Queensland, but may occur in dry rocky places. The juvenile foliage is always broad and often with the venation very marked. The mature foliage may be broad or lanceolate: its texture varies, but it is usually coriaceous. Its transit to normal *tereticornis* appears (in one direction) to be through *E. angulosa*, Naudin, a form I cannot recognise as of specific value. (*Proc. Linn. Soc. N.S.W.* 773 [1904].)

I had it in contemplation to propose a name for a form of *E. amplifolia* with buds of comparatively large diameter resembling those of *E. tereticornis* var. *latifolia*. and with sessile buds and fruits. but found that both the characters mentioned were unstable.

RANGE.

This species is found in New South Wales and Queensland, both in the coastal districts and table-lands. I have it as far south as Colombo (Candelo), and it may be expected to be found in Gippsland, Victoria. In the coastal districts it occurs in many localities not much above sea-level. As a very general rule it is found in swampy situations or in places temporarily submerged, or at least within easy reach of subterranean water. In New England (both in New South Wales and Queensland) it has been recorded from a number of localities between 3,000 and 4,000 feet, and it is perhaps that close relation of *E. tereticornis* which attains the highest elevation. *E. Bancrofti* being its competitor in this respect.

Going north we have it in the Queensland coastal areas from the Rockhampton district; how far further north it extends is a matter for investigation.

NEW SOUTH WALES.

Southern districts.—"Red Gum," Colombo, Candelo (W. Baerleren): Queanbeyan (H. Deane); near Goulburn (Dr. J. B. Cleland).

Goulburn to Bowral (J.H.M.). The "Swamp Gum" form with long, narrow, horned opercula, broad leaves and small fruit. Received also under the name "Broad-leaf Blue Gum," from Marulan (A. Murphy).

"Blue Gum." Large trees on summit of hills and in rare cases on the flats. It has a ribbony bark, but the smooth blue colour of the bark is more prominent. It has fine large noble-looking leaves of a thick texture. Quarry Hills, Paddy's River, Wingello (J. L. Boorman).

Barber's Creek, now Tallong (H. J. Rumsey, J.H.M.).

Flowering almost in the juvenile leaf stage. Sutton Forest (J.H.M.). Medium sized trees of 30-40 feet, bark scaly and ribbony on the stems. Bowral (S. J. Russell).

Quadrangular, almost winged branchlets. In a boggy depression, a few hundred yards from Pomaré on the road to Narellan, at Cobbitty (J.H.M.). Appin (J.H.M.). Bankstown and Cabramatta (J. L. Boorman).

Flowering almost in the juvenile leaf stage. Cabramatta (W. Forsyth). The small-fruited Swamp Gum is very abundant in the Appin and Bankstown districts. The specimens precisely match those from Tenterfield. The suckers have quadrangular stems and the buds are of small diameter.

"Bastard Box or Grey Gum," probably in Parramatta district (W. Woolls).

Following are specimens collected by George Caley, received from the British Museum (Dr. A. B. Rendle; Nos. 11 and 55 probably came from the Parramatta district).

No. 11 (Locality?).

No. 55. "Calgargroo," "A little beyond the South Brush, October, 1807. These are doubtfully 'Cumbora.'"

Mixed with 25. "Picked up near Arayling in the road. December, 1807." "Cumbora (?)"

No. 25. "I expect this to be the Cumbora (? Cumbora) picked up in the Apple Tree Swamp at Vaccary Forest, December, 1807." Vaccary Forest is the "Cow-pasture," near the modern Camden. See my "Sir Joseph Banks: the Father of Australia," p. 130, for an abstract of Caley's journal. Arayling is probably on the way to the Vaccary Forest.

[The references to the names "Calgargroo" and "Cumbora" will be understood on reference to my paper on the aboriginal names collected by Caley in the opening years of the 19th Century, for various kinds of Eucalyptus trees in the Counties of Cumberland and Camden, in *Agric. Gazette, N.S.W.* for 1903, p. 988.

He was a most remarkable man, and it was a grievous loss to British science that his notes, his herbarium specimens, and the collection of timbers (*Trans. Linn. Soc.* xvii, 597, 1832) he made were not connected up, numbered, and carefully preserved. Paper was scarce and few localities had names in his time, but the labels in his writing which have come to light show that he spotted the points of the various species and varieties of Eucalypts far better than any observer who collected before and for long after him.

His "Calgargroo" ("Calgargro," he did not always spell uniformly) I originally referred to *E. squamosa* Deane and Maiden, (I now think it is *E. Parramattensis* C. Hall, which has been confused with *E. squamosa*), but it will be seen that Caley himself doubted whether No. 55 was "Cumbora."

His "Cumbora" ("Cumbora") is undoubtedly aboriginal for *E. amplifolia*.]

Western Localities.—Hawkesbury Agricultural College. From the supposed natural graft referred to in *Proc. Royal Soc., N.S.W.* xxxviii, 36 (1904), and later on in the *Forest Flora of New South Wales*, Vol. vi, p. 79.

Lowther Road, Kanimbla Valley, near Mount Victoria (J.H.M.). Sunny Corner (J. L. Boorman).

Near Locksley, Fish River, on the old track from Sydney to Bathurst, close to the site of the original gold discovery of 1823. (See *Proc. Roy. Soc. N.S.W.* xliii, 137, with Plates vi and vii). (R. H. Cambage and J.H.M.).

Bathurst (J.H.M.). Cullenbone, Mudgee (J. D. Cox).

Northern Localities (mainly coastal).—Gosford (A. Murphy).

On slopes of hills facing the sea, near Lake Bubararing, Kincumber; also on northern slopes of sandy hills 2 miles south of Terrigal, *not* in swamp. Stunted trees with scaly bark up to first fork. Sapwood very thick with but little red wood. Twigs very brittle. (R. H. Cambage and J.H.M.).

"Bastard or Stunted Flooded Gum, also Bastard Box. Growing on flats, about 30 feet high, branches starting about 10 feet from ground, grey bark, with withered bark hanging to trunk up to 10 feet from the ground. Used largely for fencing posts. The local opinion is that it is very durable and one of the best timbers for ground work." (Forest Guard J. D. Hay, Wyong).

"Grey Gum," Mount Vincent, county of Northumberland (correspondent of Mueller).

"Broad-leaved, small tree. Diameter 18 inches, height 40 feet. Timber no good." Dungog to Bandon Grove road (A. Rudder).

"Slaty Gum," Parish of Tinonee, Manning River (W. A. W. de Beuzeville).

"A wiry small tree about 15-20 feet high, with clinging scales of rindy bark on a smooth pinkish stem. Branches about 8 feet from ground." Taree, Manning River (E. H. F. Swain).

"Stinking-or Broad Leaf-or Flat-Gum, because growing on flats generally." With conical, not cylindrical opercula. Flowers nearly sessile; flowering while the leaves are in the juvenile leaf stage. Shows transit to *E. tereticornis* var. *latifolia*. Port Macquarie (Forest Ranger G. R. Brown, No. 433).

Grafton to Dalmorton. Fruits with longer pedicels, and fruits a little larger and fewer than the type. (J.H.M. and J. L. Boorman).

"Seems to be a cross, by the appearance of the bark, between the ordinary district Red Gum (*E. tereticornis*) and Yellow Box (*E. melliodora*)." Flowers quite sessile and flowering while the leaves are still in the juvenile leaf stage. Casino (W. F. Pope).

Broad mature leaves, very large, broad juvenile leaves with almost quadrangular branchlets. Moonanbah, Tweed River (W. Baeuerlen).

Northern Localities (New England).—10 miles east of Uralla, at 3,300 feet. (R. H. Cabbage, No. 3782). "Red Gum," Salisbury, Uralla (H. Deane).

The common Red Gum of the Armidale district, often growing in comparatively dry localities. Fruits rather larger and fewer in the head than those of the type. (J.H.M.).

"Tree of 40-50 feet. Stem bark occasionally somewhat persistent, branches smooth. Trees rather bent or limbs twisted, or more erect." Between Chandler River and Oakey Creek, also between Wollomombi and Chandler Rivers, Armidale district (A. W. Howitt).

"Forest Red Gum." Glen Innes (Forest Guard Stewart). "Forest Red Gum." Warialda (Forest Guard W. A. W. de Benzeville, No. 3). Tingha (J.H.M. and J. L. Boorman). Howell. Flowering almost in the juvenile leaf stage (J.H.M. and J. L. Boorman). "Red Gum of Tenterfield" (District Forester A. E. Stopford). "Red Gum." Branchlets angular, almost winged. Tenterfield (J.H.M.). Sessile to a very short pedicel. Operculum over the young umbel. Tenterfield to Sandy Flat (J.H.M.).

"Red Gum. Medium-sized trees of 30-40 feet, growing in fairly dry, exposed places." Jennings, now Wallangarra. (J. L. Boorman).

(a) No. 47. With broad mature leaves and nearly sessile flowers.

(b) No. 141. "From a large tree; the botanist may or may not determine this specimen as identical with No. 140 (*E. tereticornis*). There appears to be a difference in the bark; it resembles Blue Gum (*E. saligna*), although (*sic*—? and) the wood is alike."

(c) No. 351. "A very small fruited specimen of *E. tereticornis* obtained from a large tree only about 300 yards from No. 350." Acacia Creek, Macpherson Range (W. Dunn).

QUEENSLAND.

"From a sapling, the bark quite rough, like *E. amygdalina*." (A. Murphy). Bullandeen, Stanthorpe (Rev. J. H. Simmonds). (Stanthorpe is in New England). Leyburn, north-west of Warwick (A. E. A. McCahon, No. 3).

Following are practically coastal localities:—

"Blue Gum." Brian Pastures, Gayndah (S. A. Lindeman). "Maryborough, at a creek which flows into Wide Bay River (Dr. L. Leichhardt, 28th July, 1843). Maryborough West. Fruits nearly sessile (P. J. McGrath). "Water Gum, said to be of little value. Attains a diameter of 3-4 feet, and a height of 100-130 feet." Maryborough (W. H. Williams).

"Small seeded Blue Gum." North of Rockhampton (A. Murphy, No. 6). "Small seeded Blue Gum." Sessile fruits. Rockhampton (A. Murphy, No. 4). "Swamp Gum," Rockhampton (Byerley's timber tests, 1881, comm. Mueller). East of Rockhampton (P. MacMahon, No. 6).

AFFINITIES.

1. With *E. tereticornis* Sm.

E. amplifolia is an inhabitant of swampy or cold places; it has become acclimatised to localities of greater elevation than has *E. tereticornis*. This has, however, been already dealt with and so have the points of difference between the two species, which can be referred to in comparing Plates 128 and 131.

2. With *E. resinifera* Sm.

If only mature leaves and buds are available, then *E. amplifolia* and *E. resinifera* specimens may resemble each other. The venation of the two species may be not alike, although that of *E. resinifera* is more decidedly parallel, the buds are often curved and often much of the same shape, even to the double operculum on individual buds. But the juvenile foliage is far more coarse in *E. amplifolia*, while *E. resinifera* has a bark allied to the stringybarks. The fruit is more domed in *E. amplifolia*.

3. With *E. siderophloia* Benth.

There is a certain amount of superficial similarity between the two species, as comparison of Plates 47 (Vol. 1) and Plate 131 will show. Both have coarse, nearly circular foliage, and the buds are sometimes a good deal alike. The timbers of both are red, but that of *E. siderophloia* has greater tensile strength. The fruits are very dissimilar. *E. amplifolia* is a Gum, while *E. siderophloia* is an Ironbark.

4. With *E. capitellata* Sm. and

5. *E. macrorrhyncha* F.v.M.

Affinities to these species are suggested by Naudin in the original description, but the supposed affinity is far-fetched. Both these species have kidney-shaped anthers (Renantheræ), and are Stringybarks.

The figures of *E. capitellata* may be referred to in Vol. I, Plate 38, and of *E. macrorrhyncha* in Plate 39, and bear out that the relations between them and *E. amplifolia* are distant.

Explanation of Plates (128-131).

PLATE 128.

E. tereticornis Sm.

1a. Juvenile leaf; 1b, twig with buds; 1c, fruits; 1d, riper fruits. Near Mrs. Macquarie's Chair, Outer Domain, Sydney. (J. H. Camfield.) These specimens may be taken as typical of the species, the type of which was collected in the immediate neighbourhood.

2a. A larger mature leaf; 2b, buds; 2c, fruits not quite ripe. Outer Domain, from the vicinity of Mr. Camfield's official residence, a few hundred yards south of the Chair. (J. H. Camfield.)

PLATE 128—continued.

E. tereticornis Sm.—continued.

- 3a. Juvenile leaf; 3b, mature leaf; 3c, buds; 3d, front and back views of anthers; 3e, fruits. Outer Domain, at foot of official landing steps, east of Farm Cove, Port Jackson. (J. L. Boorman.) Note the difference in shape of the buds.
- 4a. Juvenile leaf; 4b, mature leaf; 4c, buds. Spontaneous tree on high ground in the north-east of the Botanic Gardens, Sydney, near the principal Cycad bed. (J. L. Boorman.)

While I suggest that 1 be taken as the type, all the specimens described and figured so far are from spontaneous trees all within the same area of a few acres, and show local variation.

- 5a. Mature leaf; 5b, buds; 5c, fruits. Rockhampton, Queensland. (A. Murphy.)

Rockhampton is a thousand miles north of Sydney, and the specimens are practically identical with the Sydney ones.

PLATE 129.

E. tereticornis, Sm., var. *latifolia* Benth.

1. Leaf and buds. Shoalwater Passage, North Queensland. (Robert Brown, 1800–4. No. 4738 of the British Museum of 1876.)
2. Front and back views of anthers, taken from a specimen precisely similar to No. 1. Mackay, Northern Queensland. (Amalia Dietrich.)
3. Juvenile or intermediate leaf. Keepkie's Dairy, Crescent Lagoon, West Rockhampton, Queensland. (W. N. Jaggard.)
4. Portion of a flowering twig from Northern Queensland. (Ferdinand Bauer in Herb. Vienna.)

E. insulana Bailey.

- 5a. Juvenile leaf, not in the earliest stage; 5b, buds; 5c, front and back views of anthers; 5d, mature leaf and very young fruits. Middle Percy Island, North Queensland. (Henry Tryon.) The type. My view is that *E. insulana* is a form of *E. tereticornis*, a stunted growth of var. *latifolia*.

E. Bancroftii Maiden.

(See also Plate 130.)

- 6a. Juvenile leaf, not quite in the earliest stage; 6b, ripe buds; 6c, mature leaf and immature buds; 6d, fruits. Honeysuckle Flat, 9 miles south of Port Macquarie, N.S.W. (J.H.M.) The type.

PLATE 130.

E. Bancroftii Maiden, excluding the Burpengary specimens.

(See also Plates 129 and 131.)

- [1a. Mature leaf with ripe buds; 1b, front and back views of anthers; 1c, buds not ripe; 1d, fruits. Burpengary, near Brisbane, Queensland. (Dr. T. L. Bancroft.) I have since arrived at the conclusion that this is an extreme form of *E. Seeana* Maiden, to which I propose to defer consideration of it in Part xxxii.]
2. Large mature leaf. Halfway Creek, near Woolgoolga, New South Wales. (E. H. F. Swain.) No. 6 of Plate 129 and the present specimen are from coastal localities.
- 3a. Buds and mature leaf; 3b, buds and mature leaf; 3c, mature leaf; 3d, fruits. New England, New South Wales. (Charles Stuart.) Typical of *E. tereticornis* Sm., var. *brevifolia* Benth.
- 4a. Mature leaf; 4b, buds; 4c, fruits. Jennings, now Wallangarra, New South Wales, on the Queensland border, where the New South Wales and Queensland railways join. (J. H. M. and J. L. Boorman.)
5. Juvenile leaf, almost in the earliest stage. Emmaville, New South Wales. (J. L. Boorman.)
6. Juvenile leaf, not in the earliest stage. Howell, New South Wales. (J.H.M. and J. L. Boorman.)
7. Coarse fruits, with broad band. Mount Lindsay Station, 3,200 feet, Nandewar Mountains, New South Wales. (R. H. Cambage, No. 2,355.)

PLATE 131.

E. Baacrofti Maiden.

(See also Plates 129 and 130.)

- 1a. Juvenile leaf, not in the earliest stage; 1b, mature leaf; 1c, and 1d, buds in various stages; 1e, front and back views of anthers; 1f, fruits. Cooma, New South Wales. A locality 350 miles south of any previously known locality. (J. L. Boorman.)

E. amplifolia Naudin.

- 2a. Juvenile leaf, with very angular petiole; 2b, leaf in the intermediate stage; 2c, young buds; 2d, mature leaf and fruits. All from cultivated French specimens in Herb. Paris, named by Charles Naudin himself. (Type.)
3. Small fruits. Bubararing, Kincumber, New South Wales. (R. H. Cambage and J.H.M.)
- 4a. Juvenile leaf; 4b, mature leaf; 4c, buds; 4d, fruits; 4e, front and back views of anthers. "Stinking Gum," Port Macquarie, New South Wales. (G. R. Brown.) [It is suggested that this is a transit form between *E. amplifolia*, Naudin, and *E. tereticornis* var. *latifolia*.]

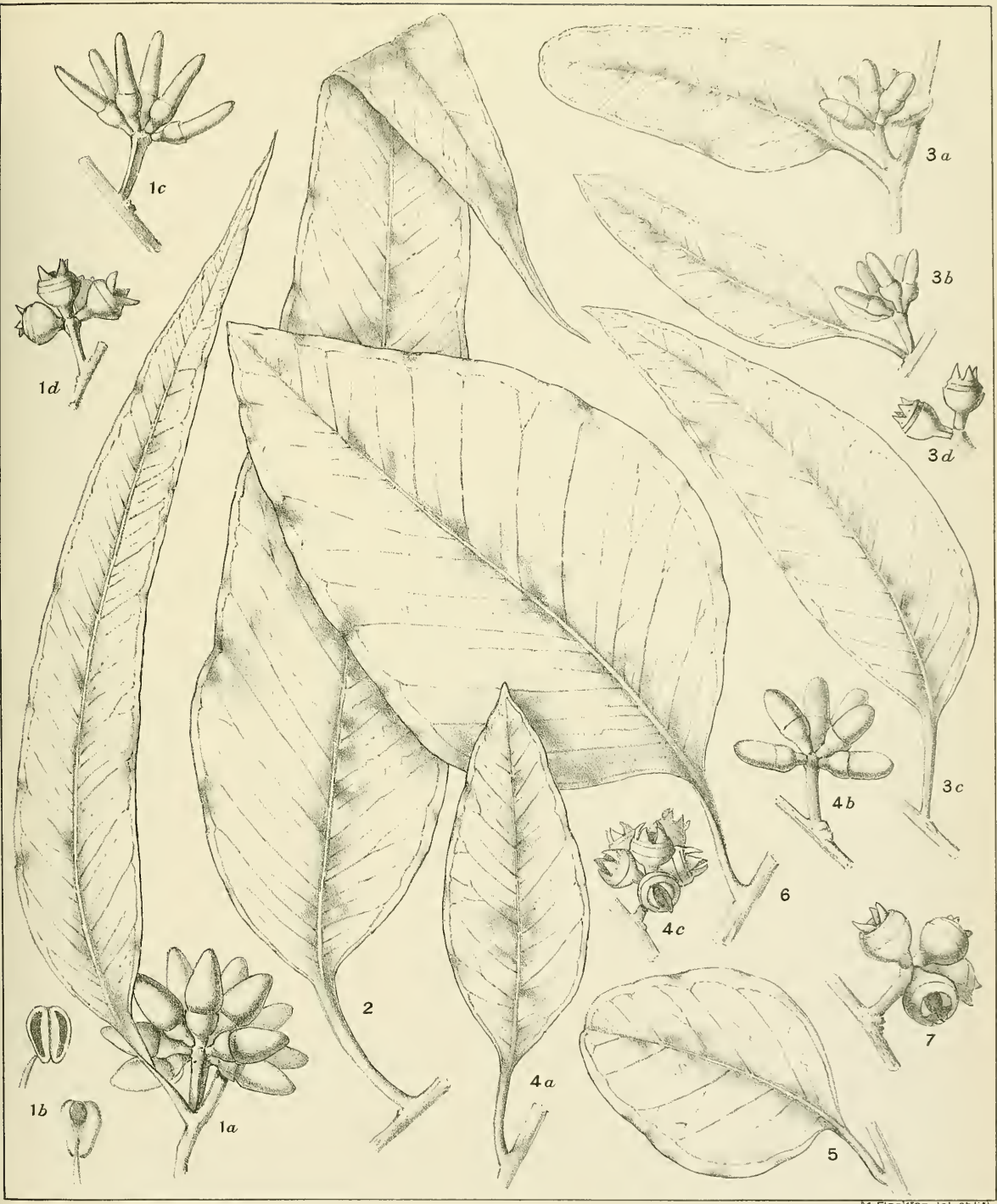
The following species of *Eucalyptus* are illustrated in my "Forest Flora of New South Wales"* with larger twigs than is possible in the present work; photographs of the trees are also introduced wherever possible. Details in regard to their economic value, &c., are given at length in that work, which is a popular one. The number of the Part of the Forest Flora is given in brackets :—

- | | |
|--|--|
| <i>acacioides</i> A. Cunn (xlviii). | <i>melanophloia</i> F.v.M. (liv). |
| <i>acmenioides</i> Schauer (xxxii). | <i>meliadora</i> A. Cunn. (ix). |
| <i>affinis</i> Deane and Maiden (lvi). | <i>microcorys</i> F.v.M. (xxxviii). |
| <i>amygdalina</i> Labill. (xvi). | <i>microtheca</i> F.v.M. (lii). |
| <i>Andrewsi</i> Maiden (xxi). | <i>numerosa</i> Maiden (xvii). |
| <i>Baileyana</i> F.v.M. (xxxv). | <i>obliqua</i> L'Hérit. (xxii). |
| <i>Baueriana</i> Schauer (lvii). | <i>ochrophloia</i> F.v.M. (l). |
| <i>Baueriana</i> Schauer, var. <i>conica</i> Maiden (lviii). | <i>odorata</i> Behr and Schlechtendal (xli). |
| <i>Behriana</i> F.v.M. (xlv). | <i>oleosa</i> F.v.M. (lx). |
| <i>bicolor</i> A. Cunn. (xliv). | <i>paniculata</i> Sm. (viii). |
| <i>Boormani</i> Deane and Maiden (xlv). | <i>pilularis</i> Sm. (xxxi). |
| <i>Bosistoana</i> F.v.M. (xliii). | <i>piperita</i> Sm. (xxxiii). |
| <i>Caleyi</i> Maiden (lv). | <i>Planchoniana</i> F.v.M. (xxiv). |
| <i>capitellata</i> Sm. (xxviii). | <i>polyanthemos</i> Schauer (lix). |
| <i>Consideniana</i> Maiden (xxxvi). | <i>populifolia</i> Hook. (xlvii). |
| <i>coriacea</i> A. Cunn. (xv). | <i>propinqua</i> Deane and Maiden (lxi). |
| <i>corymbosa</i> Sm. (xii). | <i>punctata</i> DC. (x). |
| <i>crebra</i> F.v.M. (liii). | <i>regnans</i> F.v.M. (xviii). |
| <i>dives</i> Schauer (xix). | <i>resinifera</i> Sm. (iii). |
| <i>fruticetorum</i> F.v.M. (xlii). | <i>saligna</i> Sm. (iv). |
| <i>gigantea</i> Hook. f. (li). | <i>siderophloia</i> Benth. (xxxix). |
| <i>goniocalyx</i> F.v.M. (v). | <i>sideroxydon</i> A. Cunn. (xiii). |
| <i>hæmastoma</i> Sm. (xxxvii). | <i>Sieberiana</i> F.v.M. (xxxiv). |
| <i>hemiphloia</i> F.v.M. (vi). | <i>stellulata</i> Sieb. (xiv). |
| <i>longifolia</i> Link and Otto (ii). | <i>tereticornis</i> Sm. (xi). |
| <i>Luehmanniana</i> F.v.M. (xxvi). | <i>virgata</i> Sieb. (xxv). |
| <i>macrorrhyncha</i> F.v.M. (xxvii). | <i>vitrea</i> R. T. Baker (xxiii). |
| <i>maculata</i> Hook. (vii). | |

* Government Printer, Sydney. 4to. Price 1s. per part (10s. per 12 parts); each part containing 4 plates and other illustrations.



EUCALYPTUS TERETICORNIS Sm.



EUCALYPTUS BANCROFTI MAIDEN. [See also Plates 129 and 131.]

DESCRIPTION.

CLXI. *E. Seeana* Maiden.

IN *Proc. Linn. Soc. N.S.W.*, xxix, 469 (1904).

THE original description is as follows :—

A smooth-barked tree of medium size, with blotches on the bark, most closely resembling that of *E. tereticornis*; sometimes with a grey smoothish bark, reminding one of that of *E. punctata* and *E. propinqua*.

The timber is deep red in colour, and Mr. District Forester Wilshire, of Grafton, informs me that it bears a high reputation for durability. He has sent me a piece of a fence post from Nymboida which has been in the ground for thirty years, and which is perfectly sound. It is known locally as "Stone Gum."

Juvenile leaves petiolate, narrow-linear and falcate, say 4 inches long and $\frac{3}{4}$ inch wide, with numerous prominent transverse veins.

Mature leaves with long, slender petioles, the leaves attaining a length of 9 inches and more, with an average width of, say, $\frac{5}{8}$ inch; texture rather thin, equally dull on both sides, with numerous minute transverse veins; the intramarginal vein distinct and somewhat removed from the edge of the leaf. The foliage slender, graceful and drooping.

Buds narrow, the operculum long and tapering, of the *tereticornis* type. The inflorescence usually up to seven in the head in the axils of the leaves, the peduncle about $\frac{3}{4}$ inch long and the pedicels about $\frac{1}{4}$ inch in length.

Fruit.—The peduncle and pedicel of the fruit are but slightly angular. Fruit small, nearly hemispherical, its diameter about $\frac{1}{4}$ inch; the rim well defined, forming a broadish band with the top of the rim truncate and the valves (three or four in the specimens seen) well exerted.

This is a species that I have had under observation for a considerable period, but I hesitated to raise it to specific rank until I had seen it in the field.

I name this graceful and useful species in honour of Sir John See, K.C.M.G., late Premier and Chief Secretary of New South Wales, long my respected official superior, in whose electorate (Grafton) I first found it, and in which it is not rare. This tree will also perpetuate the memory of the late Lady See, who always evinced a keen interest in the vegetation of the State in which she was born.

Often (perhaps always) the individual buds have a double operculum which, when it falls off, leaves a distinct scar, where the calyx-tube is of a greater diameter than the operculum.

Although in its typical form it has rather thin leaves, yet exceptionally (*e.g.*, Burpengary, Queensland), they may be quite thick, with veins quite obscure. Some of the Burpengary specimens are remarkably robust and the buds are not narrow but coarse, and are described below, p. 32. The same remarks apply to the Burpengary fruits, which are much coarser than those of the type.

SYNONYM.

E. tereticornis Sm. var. *linearis* Baker and Smith, "Research on the Eucalypts," p. 74.

RANGE.

This species occurs in New South Wales and Queensland, and is best known in coastal districts from Port Macquarie in the former State to Moreton Bay in the latter, usually in sour, undrained land.

South-west of Port Macquarie, going inland, it is probably found in the County of Gloucester in country of moderate elevation. A few miles north-west of that we find it at an elevation of about 2,000 feet at Murrurundi. Then we have it between Acacia Creek and Wilson's Downfall, south of the Macpherson Range, at an elevation of under 3,000 feet.

NEW SOUTH WALES.

Mr. J. L. Boorman and I found it a few miles from Grafton on the Glen Innes road, and also on the Coramba road (July, 1903). The Grafton specimens, on the Glen Innes road, form the type.

Mr. District Forester Wilshire states that it is plentiful at Nymboida in the Clarence River district. I have also seen it between the Clarence and Richmond Rivers.

"Cabbage Gum, Tooloom. "Occurring at various points between Drake and Tabulam, Upper Richmond River. Good for posts, but bad for splitting or sawing. Withstands bush fires, which run round it and only blacken it." (R. H. Cambage, No. 2,898.) I have collected it at Tooloom, which is in the Upper Clarence district, and so has W. Dunn, who records it from "Gold belt of rocks, Tooloom."

Going south from the Clarence, I received it from the Macleay River in 1893 from Mr. Forester MacDonald under the name of Grey Gum.

Port Macquarie to Telegraph Point, near the 7-mile post from the former place. In poor ill-drained land. (R. H. Cambage and J.H.M.)

Tree 3 feet in diameter and 50 feet high, larger than I have previously seen it. With pedicels thicker than in the type. The prevalent colour of the foliage is dull, and it is somewhat rich in oil. We found numbers of very narrow-leaved seedlings. These large trees showed no signs of the species petering out; I have already noted some northern records; some more southern records become highly probable.

In the *Agric. Gazette of N.S.W.* for January, 1896, p. 15, appeared the following statement by the late Augustus Rudder, an experienced forester :—

"whilst that of the very narrow-leaved variety, the wood of which is of a rather lighter red in colour than the other, is unlocked, harder, and is very lasting both in and out of the ground. This timber might be highly recommended for use in bridges and culverts but for this danger, that the inferior kinds, of which their woods are very similar in appearance, might be mistaken for it, or used wrongfully by unprincipled contractors. Of this narrow-leaved kind I have now before me part of a fence post which I took out of the ground in May last, from where it had been for over fifty years, and is now quite fresh looking and tough, and sound as ever."

On 18th May, 1904, he wrote as follows in reply to my request for further information :—

"This tree is of large size up to 3 and 4 feet in diameter, and of corresponding height, is of wide distribution, and is fairly plentiful on the roadside between Stroud and Gloucester, also in western parts of the county of that name in many places. Have also seen it on the Richmond River. It is generally found on low-lying flats, not always, but generally near water. The leaves of some of these trees are very narrow, and mostly sickle-shaped, and the blossoms not unfrequently of more or less reddish colour. This tree is associated with another variety of *E. tereticornis*, which is very similar in general appearance, but the timber of the latter is of a darker red, and is soft and worthless. Its leaves also are broader, and the operculum much more pointed.

If you would like further confirmation of what I have said about the timber of the first-mentioned tree, I would refer you to A. T. Lawry, Esq., of Rawdon Vale, via Gloucester, on whose property the fence, from which the post I referred to was taken, was erected."

There is an element of uncertainty in regard to the "very narrow-leaved variety," and I am sorry I did not ask Mr. Rudder for specimens before he left the Forest Department, but I think *E. Seeana* is probably referred to as one of the "two varieties of *E. tereticornis*." It should be looked for between Stroud and Gloucester, and the western part of the County of Gloucester generally.

Somewhat north-west of this, we have "Ribbon or Red Gum" from Murrurundi (W. F. Blakely). The leaves are comparatively broadish, and there are no buds.

We now take a jump to the New South Wales-Queensland border, and it is only a question of time when material will be available from intermediate localities.

"Obtained in granite country; fairly large tree. This tree can be easily picked out from the other Red Gums (*E. tereticornis*) about, as it is a scaly bark and inferior looking tree with no barrel of any value." Acacia Creek, Macpherson Range (W. Dunn, No. 353).

"May be *E. tereticornis*, but leaves are not so plainly veined, and fruit slightly different; small tree." (W. Dunn, No. 184.) "Small tree. I do not think this will prove to be *E. tereticornis*, if so, the species varies a good deal." (W. Dunn, No. 185.) Both 184 and 185 are from "high altitude, Acacia Creek towards Wilson's Downfall."

On acid granite, Wilson's Downfall. (R. H. Cambage, No. 2,833.)

"*Eucalyptus tereticornis* Sm., placed with *E. fibrosa* by Bentham." This is Mueller's label on a specimen collected and labelled by Dr. Leichhardt, circa 1843. "No. 102, Binnandak." (? Binnandale). I do not know whether this locality is in Queensland or New South Wales. The reference to *E. fibrosa* will be understood on turning to vol. i p. 325, of the present work.

QUEENSLAND.

Mr. C. J. White has recently sent this from Albion Park, a suburb of Brisbane, and he says it is not rare in the district. He describes it as with a "smooth, blotchy bark, somewhat like that of *E. propinqua*."

"Cabbage Gum." "Young growth from burnt saplings after a bush fire." These are linear-lanceolate. Burpengary, Moreton Bay, South Queensland. (Dr. T. L. Bancroft.)

Dr. Bancroft's notes are : " Wood red ; timber, useless ; grows in swamps near the coast ; trunk and branches always crooked ; tree very stunted, under 50 feet ; decays in the centre ; very short in the grain. A common tree from Redcliffe to Caboolture. I do not know its wider range."

The leaves are all lanceolate. Some leaves are falcate and thicker. The operculum varies from subulate to conical. Sometimes, particularly in the coarse foliated specimens, the operculum becomes swollen in a ring at a little distance beyond the suture. In drying, such buds exhibit a constricted appearance—viz., just above and just below the swelling. The valves are markedly pale.

These specimens, the most northerly seen by me, were at one time considered by me to belong to *E. Bancrofti*, and were accordingly so figured in figs. 1a-d plate 130 part xxxi, which see.

I have received specimens from Rockhampton (Queensland) which I doubtfully refer to *E. Seeana*.

It is a species which commonly passes under the name of *E. tereticornis*, and some time must elapse before we know its full range.

AFFINITIES.

1. With *E. tereticornis* Sm.

The narrowness of the young foliage is an obvious character, and attracts the attention of the non-botanist. This narrowness sharply separates it from *E. tereticornis*, a close ally, which has broad juvenile leaves. *E. tereticornis* has mature leaves of a brighter green, with well-marked venation ; their lustre is never dull. The buds of *E. Seeana* have the operculum of less diameter than that of the calyx tube, owing to a deciduous outer operculum ; this character has never been observed in *E. tereticornis*.

2. With *E. Bancrofti* Maiden.

The juvenile leaves of *E. Seeana* are linear ; those of *E. Bancrofti* are broadly lanceolate to nearly ovate ; this sharply separates them. The mature leaves of *E. Bancrofti* vary from short and blunt to falcate-lanceolate ; those of *E. Seeana* are invariably of the latter form and are usually (though not invariably, e.g., Burpengary) thinner than those of *E. Bancrofti*.

The operculum of *E. Bancrofti* is cylindrical-blunt, occasionally (e.g., Stanthorpe, Q., and Camden Haven, N.S.W.) becoming more elongated and pointed, but obviously connecting with the normal form.

3. With *E. squamosa* Deane and Maiden.

There is some general similarity in the appearance of the seedlings of *E. Seeana* and *E. squamosa* Deane and Maiden, but the cotyledon leaves are bilobed in the former case, and bisected in the latter.

Vol. ii plate 73 of the present work may be turned to as regards *E. squamosa*, which is a smooth-barked tree (so is *E. Seeana*, but usually more erect), with broad juvenile leaves, and quite different buds, anthers and fruits.

DESCRIPTION.

CLXII. *E. exserta* F.v.M.IN *Journ. Linn. Soc.* iii, 85 (1859).

FOLLOWING is a translation :—

A tree with thin, angular branchlets, *leaves* alternate, narrow-lanceolate, elongated, slightly curved, moderately petiolate, acuminate, opaque, covered with clear dots, faintly penni-veined, peripheral vein distant from the margin, with axillary and lateral *umbels*, solitary, 3-7 flowered, the *petiole* longer than the angular peduncle, the *calyx* shortly pedicellate, the *operculum* conical and somewhat obtuse, and twice as long as the hemispherical and indistinctly ribbed calyx-tube; *capsule* nearly globular, 3-5 celled, half protruding from (*semisupera*)* the calyx-tube, valves deeply exsert, *seeds* winged.

Habitat in the less fertile meadows near the Burnett River (Queensland). Flowering in January and February.

A small tree or of medium height, the bark persistent on the trunk and branches, ashy-brown, wrinkled and scaly, rough and fissured outside the falling in fragments, sub-fibrous on the inner. Leaves 3-6 inches long, 4-8 lines broad. Peduncles 3-5 lines long. Capsule measuring about three lines, with short deltoid valves arising above the margin of the calyx. The fruit therefore is not dissimilar to that of *E. rostrata*. Seeds angular, faintly wrinkled, the fertile ones blackish. While it stands, as it were, midway between the Eucalyptus trees known as "Bloodwood" and "Stringybark" as regards the structure of the bark, it is most similar, in particular points to *E. fibrosa*.

It was described in English by Bentham (B. Fl. iii, 241), but Mueller himself, in the "Eucalyptographia" sank it under *E. rostrata*.

I published a preliminary note on the species in my *Forest Flora of New South Wales*, vol. ii p. 11.

A prominent character is the very broad sloping rim of the fruit, and its very exserted valves, like cusps.

It has in young trees a thin sub-fibrous, harsh, closely appressed bark which is known by most Australians (in eastern Australia at any rate) as "Peppermint." This kind of bark was originally associated with a Sydney tree whose leaves exhaled a peppermint odour when crushed in the warm hand, and, strange to say, this class of bark confers the name of Peppermint on other trees, irrespective of the odour of the leaves.

* As to the meaning of this word, the reader is invited to contemplate the fruits at fig. 7a plate 132, which are characteristic. I will discuss the subject further in dealing with "The Rim in Eucalyptus fruits," in part ii of the present work.

Meantime my readers may be reminded that the capsule, which is adnate to the persistent calyx-tube, is, in Eucalyptus, sunk to varying degrees in the calyx-tube. Thus it may be wholly sunk, or the tips of the capsule-valves may protrude more or less beyond the level of the top of the calyx-tube.

In *E. exserta* the unusually broad, belted rim, is part of the capsule—the middle third, let us say. The lowest third of the capsule is sunk in the calyx-tube, and the top-third consists of the exserted valves.

I have divided the capsule into thirds for clearness, but the proportions vary.

In the type specimen "capsula semisupera" (*supera*=that which is above or higher) means one in which the capsule, irrespective of the valves, protrudes for about half its length (out of the calyx-tube). It is understood that a "half" is an approximation, just as a "third" is. The specific name *exserta* probably was intended by the author not merely to refer to the protrusion of the valves, which is the usual meaning of the word "exsert" in Eucalyptus descriptions, but to the protrusion or exsertion separately (or in addition to the valves) of the belted portion of the calyx beyond the calyx-tube.

In the case of *E. exserta*, however, the bark is not a pure "Peppermint" one, rather more scaly, reminiscent of a Bloodwood, but yet not scaly enough to be a typical Bloodwood, so the bushman makes the compromise and terms it "She Bloodwood." The use of the term "She" by the Australian timber-man may signify inferiority of strength or colour, as compared with the prototype, and sometimes, as in the present case, it may perhaps not indicate inferiority at all, but that it is not quite *it*.

It is the "Bendo" of Central Queensland aborigines, according to the late P. O'Shanesy.

RANGE.

It is confined to Queensland, and to the eastern half of the central portion of that State, so far as we know at present. Southerly we know it from the Eidsvold, Gayndah, Maryborough line of direction, and we bear north-west to 20 miles west of Emerald, which is the most westerly locality known at present. Then north-east to between Clermont and Mackay, we have the most northern proved locality.

Bentham (B. Fl. iii, 241) quotes Murchison River, Western Australia (Oldfield), though with some reservation.

In "Eucalyptographia" Mueller says "*E. exserta* is now known to range from the Burnett to the Gilbert River, but does not extend to West Australia."

At bottom of p. 35 I show how slender is the evidence on which Mueller relies for the Gilbert River locality, but I agree with him in saying that it does not extend to Western Australia.

Oldfield's specimens are referred to below, and it is in allusion to these that Mueller delivers his pronouncement that *E. exserta* does not extend to Western Australia. The specimens are not typical *E. rostrata*, but show some transition to *E. rudis*.

Following are the localities I know of, and specimens from most of them are in the National Herbarium, Sydney :—

"Bark intermediate between a Stringybark and an Ironbark. The top branches are naked; they shed their bark as in *E. hemiphloia* and *E. drepanophylla*. I only know one tree at present." Eidsvold (Dr. T. L. Bancroft).

"Mountain Bloodwood." Brian Pastures, Gayndah (S. A. Lindeman), and Maryborough West (P. J. McGrath, No. 12). both in fruit only, and with small fruits, probably belong to this species. "Peppermint," Maryborough (W. H. Williams).

"A rough-barked tree, both in stem and branches. Usually not well developed, generally faulty and hollow in large trees. Useful for fencing, fire-wood and the general rough work on the land. Fairly plentiful through this and adjacent districts." Bundaberg (J. L. Boorman). This is nearly the type locality, which is the Burnett River.

Now we come to the Rockhampton district :—

Mt. Morgan (C. F. Henrickson). Rockhampton (A. Thozet). "*E. rostrata* Schlecht. (*E. exserta* F.v.M.)" in Mueller's hand-writing. Rockhampton (R. H. Cabbage, No. 3993). "Messmate" Rockhampton (A. Murphy).

"She Bloodwood." With fruits markedly different in size, and associated with *E. corymbosa* Sm. and *E. crebra* F.v.M. Sucker leaves narrow. Duaringa (J.H.M.). (I went to Duaringa because the late P. O'Shanesy had seen it there, and I had to decide what position to take up in regard to the species.).

"Messmate" or "Pepperina." Duaringa (A. Beck). [By "Pepperina" the South American Pepper-tree (*Schinus molle*) is usually meant in Australia, and I cannot see any resemblance. I think "Peppermint" is really meant]. "A Stringybark." Duaringa (A. Murphy, Jr.; R. H. Cabbage, No. 3,990).

A Mr. Norton, whom I met at Duaringa, stated that he distilled Eucalyptus oil for some years and found the Bendoo (presumably *E. exserta*) to be richest in oil.

Comet River (P. O'Shanesy). Summit of The Virgin, Springsure (J. L. Boorman).

We are now in a position better to understand Mr. O'Shanesy's notes on the occurrence of *E. exserta* going west from Rockhampton along the railway line.

"Arriving at Duaringa, 65 miles from Rockhampton, . . . in company with the above (*Eucalyptus citriodora* or Scented Gum), we found *Eucalyptus exserta* (locally known as the "Shea (*sic*) Bloodwood"), a tree of 50 to 60 feet in height, having the appearance of *E. corymbosa*, but the bark is soft and fibrous, and the capsule small, resembling that of *E. tereticornis*" (O'Shanesy, p. 16).

Six miles from Emerald on sandy ridges he speaks of *E. exserta*, and adds that it is plentiful on the ridges in the district generally, and again remarks on *E. citriodora*. He says : "These two Eucalypts are only found in elevated districts, and it is noticeable that they are generally, if not always, found in company." (*ib.* p. 26).

"We traced *Eucalyptus exserta* from Stanwell (a village about 16 miles west of Rockhampton) to 184 miles west from Rockhampton, always occurring on sandstone formations." (*ib.* pp. 34 and 41, "Flora of Queensland," P. A. O'Shanesy, Rockhampton 1880).

"Messmate. Very plentiful, sparse narrow leaves; reminds me of *amygdalina*. Timber brown, not red, soft, easily split. Rarely more than 2 feet to 2 ft. 6 in. in diameter. A mountain growth—sides and tops of mountains." 30 miles north of Rockhampton (A. Murphy).

"Was noticed by me on the basaltic ridges between Port Mackay and Clermont. This is the most northerly habitat hitherto recorded. "It is a fine tree, and the wood is excellent. I also saw it at Springsure, and again it has been pointed out by Mr. O'Shanesy as flourishing near Rockhampton in one small patch." (Rev. J. E. Tenison-Woods in *Proc. Linn. Soc. N.S.W.*, vii, 341).

Somewhere between Mackay and Claremont remains the most northerly locality recorded, so far as I am aware, as it would be unsafe to accept the Gulf of Carpentaria locality referred to in the following paragraph, on the evidence available.

Gilbert River (R. Daintree). "*E. rostrata* Schlecht. (*E. exserta* F.v.M.)" in Mueller's handwriting. I think that this is perhaps correctly referred to *E. exserta*, but the specimen is only in young bud.

AFFINITIES.

1 and 2. With *E. tereticornis* Sm. and *E. rostrata* Schlecht.

"This is probably the same as *E. rostrata*, notwithstanding the differences described in the bark." (B. Fl. iii, 241).

E. exserta has for many years been erroneously included under both *E. rostrata* and *E. tereticornis*. Mueller in *Eucalyptographia*, under *E. rostrata*, says, "In respect to the fruit *E. exserta* approaches closer to *E. tereticornis* than to *E. rostrata*, differing from both in the persistency of its outside wrinkled and rough, inside somewhat fibrous bark; both *E. tereticornis* and *E. exserta* have the stalklets often thicker and shorter than *E. rostrata*."

But a more obvious difference between this species and *tereticornis* and *rostrata* lies in the brown (not red) timber of *exserta*.

As regards *E. tereticornis*, Plate 128 (Part XXXI) may be referred to, and, as regards *E. rostrata*, Plates 136 and 137 (Part XXXIII). The broad juvenile leaves of both species (particularly the former) sharply accentuate them from *E. exserta*, and so do the usually narrower mature leaves of the last.

In the forest, the rough bark of *E. exserta* is a distinct character.

While normally the buds of *E. tereticornis* and *E. rostrata* are different enough from those of *E. exserta*, certain exceptional buds suggest caution. The fruits of *E. tereticornis* more closely resemble those of *E. exserta* than do those of *E. rostrata*, the latter being more hemispherical and with a sharper, flatter rim. In *E. exserta*, as compared with *E. tereticornis*, the whole fruit is narrower, the rim is broader, and the valves much more exsert.

3. With *E. rudis* Endl.

"There may be also some confusion in Oldfield's specimens (from the Murchison River, Western Australia), the larger-flowered ones may belong to *E. rudis*, which differs in its large flowers, shorter pedicels, and in the much larger fruit with a flat rim." (B. Fl. iii, 241).

E. rudis is a Gum (not a Peppermint), having a smooth bark with a more or less rough butt. It has broad juvenile leaves, and the fruit tends to be hemispherical, and is often urceolate.

Oldfield's Murchison specimens that I have seen I would attribute to a large fruiting form of *E. rostrata*, tending to *E. rudis*.

4. With *E. Morrisi* R. T. Baker.

See p. 58.

DESCRIPTION.

CLXIII. *E. Parramattensis* C. Hall.

IN *Proc. Linn. Soc. N.S.W.* xxvii, 568, 1912 (1913).

FOLLOWING is the original :—

Arbor mediocris, levis, 15-30 ped., ramulis angulatis, teretibusve pendulis; foliis heterophyllaceis, primis vel juvenilibus in petiolum contractis, alternis, 7"-9" longis, $1\frac{1}{2}$ " latis, lanceolatis, falcatis; secundis vel maturis alternis, petiolatis, lanceolatis, nonnunquam falcatis, 5"-6" longis, concoloribus, subcoriaceis, nonnunquam nitidulis; venis prominulis, vena media pallida, venis lateralibus nonnihil obliquis, patule ascendentibus, reticulatis, ante marginem unitis, vena peripherica a margine nonnihil remota; glandulis oleosis numerosis; pedunculis axillaribus, 4'''-6''' longis, 4-7 floris; floribus pedicellatis, operculo hemisphærico, nonnunquam breviter acuminato, 3"-4" longo, calycis tubo circa 2" longo; fructu hemisphærico, 3" lato, margine rotundo, valvis exsertis.

A medium-sized tree, 15-30 feet high, as far as seen; branchlets angled or round, drooping, giving the tree a light graceful appearance; stem 2-2 $\frac{1}{2}$ feet in diameter. Found growing in a flat, low-lying situation, on poor clay soil, in company with *E. hæmastoma*.

Timber.—A pale pink-coloured wood, of little economic value, as far as seen; it is soft, seasons badly, and is attacked by borers in the young trees, so far as known. Perhaps now that the species is differentiated, more favourable specimens may be discovered.

Bark smooth, whitish or greyish, stripping off in flakes in the autumn, intermediate between the barks of *E. hæmastoma* and *E. punctata*, but without the insect-markings of the former.

Leaves heterophyllaceous.

Seedling leaves.—Cotyledons very small, obtusely triangular, sometimes slightly emarginate; first pairs of leaves linear or narrow-lanceolate, obtuse, opposite, decussate, petiolate.

Primary or juvenile leaves large, up to 7 or 9 inches long and over an inch broad, petiolate, lanceolate, falcate. Secondary or mature leaves lanceolate, sometimes falcate, but smaller than the primary leaves, a uniform dark green colour on both sides, subcoriaceous sometimes shining; venation moderately well-marked, the reticulations giving a roughish surface; lateral veins oblique, fairly distant, and having a looping arrangement with the marginal vein, which is clearly defined and fairly removed from the edge; oil-glands numerous.

Peduncles axillary, 4-6 lines long, bearing few flowers, 4-7.

Buds on a short pedicel, $1\frac{1}{2}$ -2 lines long; calyx-tube $1\frac{1}{2}$ lines long; operculum hemispherical and domed or conical and shortly acuminate, much longer than calyx-tube.

Fruit hemispherical, 3 lines in diameter, rim rounded to the dome of the ovary or base of valves, which are free from the rim and often recurved.

In dealing with this species, Dr. Hall has taken cognizance of the seedling in comparison with the form I have hitherto called "juvenile" in this work. I have over 2,000 coloured drawings of seedlings of *Eucalypts* in various stages, and think it is desirable to devote special chapters of this work to a collective and comparative study of these seedlings, with adventitious leaf-growths.

SYNONYMS.

E. tereticornis Sm. var. *sphaerocalyx* F.v.M.

E. tereticornis Sm. var. *amblycorys* F.v.M., partly.

I cannot trace that these names were ever published, but a number of specimens of *E. Parramattensis* were distributed by Mueller under these names between 1865-1875. The localities of some of them will be given presently.

E. brevifolia Benth. from New England (now included in *E. Bancrofti* Maiden), was also distributed by Mueller as *E. tereticornis* Sm. var. *amblycorys* F.v.M.). See Part XXXI, p. 15.

RANGE.

The species is confined to New South Wales.

The author gives the habitats as Fairfield, Cabramatta, Auburn (C. Hall), Milton (R. T. Baker). The first three are a few miles south of Sydney. Milton is on the South Coast, 130 miles from Sydney.

I have received a specimen, near Public School, Fairfield (coll. C. Hall), and elect to take that as the type. It has often been highly inconvenient to assume that more than one specimen can be the type.

It occurs, usually on swampy or undrained land, on the southern tableland as far south as Bargo Brush, and coastally as far south as Milton; north-westerly of Sydney it has been found between Mudgee and Cassilis and south of Singleton. This indicates that its specific name has ceased to be as descriptive as was originally believed, and that its peculiar range as at present ascertained is destined to be considerably modified.

The following two specimens, received from the British Museum of Natural History were collected by George Caley, probably in the Parramatta district.

(a) "Governor's" (*sic*) Pendleton, September, 1804. Calgargroo." [Pendleton is a suburb of Salford, near Manchester, where Caley came from, and he often applied in New South Wales, the names of places they reminded him of in his native and adjoining counties in England. I do not know precisely the site of the New South Wales Pendleton.]

(b) "Calgargroo. Behind Robinson's Farm, December, 1807. Got from the east" (*sic*). Or is it "rest," signifying "selected from other specimens?"

I have referred to the aboriginal name "Calgargroo" under *E. amplifolia* in Part XXXI, p. 22, since a specimen belonging to that species is one to which Caley doubtfully attributed it. In the *N.S.W. Agric. Gazette* for October, 1903, p. 991, I originally attributed it to *E. squamosa*, but am now satisfied that "Calgargroo" should be given as the aboriginal name for *E. Parramattensis* in the counties of Cumberland and Camden.

The following five specimens were collected by the late Rev. Dr. Woolls south of the Parramatta River :—

(a) "*E. tereticornis* var. *amblycorys*" (Mueller's label). "By Bentham regarded as doubtfully belonging to *E. viminalis*" (Mueller) near Duck River, Parramatta (Rev. Dr. Woolls). [The Duck River is a small stream which rises near Bankstown, passes near the railway line at Clyde, near Granville, and empties into the Parramatta River just west of Newington.]

(b) Another specimen, same locality and collector, has Mueller's label "*Eucalyptus viminalis*? (Bentham)," "most probably a state of this plant is *E. pilularis* Sm." "A Flooded Gum." I do not understand this allusion to *E. pilularis*, a widely different species.

(c) Another specimen in the Melbourne Herbarium, with more pointed opercula bears the label in the late Mr. J. G. Luehmann's handwriting, "Blue Mountains" (perhaps a mistake). "Labelled *E. viminalis* by Mueller; I think it is a form of *tereticornis*."

Other Melbourne Herbarium labels read :—

(d) "Labelled *tereticornis* by Mueller, *E. saligna*. Port Jackson to Blue Mountains (Woolls)." (This was a phrase often adopted in the *Flora Australiensis* for plants collected in the county of Cumberland).

(e) "*E. tereticornis* var. *sphaerocalyx* Mueller, *E. viminalis* (?) of Bentham. Flooded Gum, smooth bark, tree of 30–40 feet. Duck River, Parramatta (Woolls)."

Auburn (G. Stirling Home, March 1888), is not very far away, a short distance in the direction of Sydney.

"Red Gum. Large trees of drooping habit scattered all over the low-lying districts. Stems mottled grey and white. Timber soft and ringy. Centre wood red." Bankstown and Cabramatta (J. L. Boorman, No. 21); also Upper Bankstown (No. 6).

All the above specimens were obtained in the watershed of the Duck River, or adjacent thereto.

The following localities show that it has been obtained close to the foot of the Blue Mountains, but I do not know of any actual Blue Mountains localities :—

Grose River, N.S.W., and banks of Nepean River, near confluence with the Grose (J. H. M. and R. H. Cambage). [Robert Brown collected here about May, 1803, and January, 1805, and doubtless George Caley, although I have no Caley label marked Grose River.]

Richmond (Henry Deane). Near Public School, Agnes Banks, near Richmond (A. Farlow).

Now we go south.

Thirlmere, near Picton (Walter Cambage). "Weeping Gum." Shepherd's Swamp, Hill Top (J.H.M.).

"Weeping Gum. Pendent tree of 30-40 feet. Bark like Blue Gum. Found in aqueous situations, very partial. Bargo Brush." (Louisa Atkinson, August, 1865.) "Labelled *E. viminalis* var. by Bentham." Bargo Brush is between Picton and Mittagong. The following locality is much more south, but is on the coast, not on the tableland. Milton (R. T. Baker).

The following localities are great jumps to the north-west from Richmond, Nepean River, the nearest previous records :—

"Timber brittle and locally regarded as of little value." Howe's Valley, 36 miles south-west of Singleton (R. H. Cambage, No. 1526).

Near Green Hills, Cassilis to Mudgee (R. H. Cambage, No. 2719).

AFFINITIES.

1. With *E. tereticornis* Sm.

"This species has evidently been confused with *E. tereticornis*, a tree common in the neighbourhood in which it grows. The fruits of this tree are quite distinct from those of *E. tereticornis* and its varieties, for the rim, instead of being domed, is rounded like the edge of a pudding-basin, a feature that characterises it from any other species" (C. Hall).

The labels already quoted show that *E. Parramattensis* has been included in *E. tereticornis* (as a named variety), but that was before I carved some species out of the latter and more strictly defined it. See the last and present Parts.

I agree that it is a valid species, and had intended to deal with it when the *E. tereticornis* group was reached in this work.

E. tereticornis is a sound tree of erect habit; *E. Parramattensis* is the reverse. The juvenile leaves of *E. tereticornis* are broad and its opercula long (there are exceptions); those of *E. Parramattensis* are narrow and short respectively, by comparison.

Dr. Hall draws attention to the rounding of the rim of the fruit, like the edge of a pudding-basin. This is a rim which is part of the calyx-tube, and is not part of the rim proper as in *E. exserta* (see footnote, p. 33), *E. tereticornis* and other species:

It is, however, not unique in *E. Parramattensis* as Dr. Hall supposes, as it is commonly found in *E. resinifera* and also in *E. propinqua* and *E. squamosa*, and to a less extent apparently, in *E. punctata*. This rounded edge is, however, only properly shown in ripe fruits, and most Eucalyptus fruits in herbaria are inclined to be unripe, and, when this is the case, we have more or less angularity of the rim.

2. With *E. Seeana* Maiden.

"From var. *lanceolata* R. T. Baker and H. G. Smith, of *E. tereticornis* (syn. *E. Seeana* Maiden), it differs in the shape of the fruits, timber, and primary leaves" (C. Hall).

The reference is *E. tereticornis* var. *linearis* Baker and Smith, not *lanceolata*. Whether it is desirable as suggested by Dr. Hall to sink *E. Seeana* to a synonym of *E. tereticornis* may be decided in a moment by comparing the juvenile leaves of the former, Plate 132 (Part XXXII), with those of the latter, Plate 123 (Part XXXI).

In comparing species, it is convenient to indicate in detail the differences or similarities. So far as I am aware, *E. Parramattensis* is a gnarled tree with inferior timber (it is perhaps a disappearing species), while *E. Seeana* is more erect, with sounder timber. The fruits of *E. Parramattensis* are more hemispherical and have a rounder rim, while the operculæ of *E. Seeana* are much more elongated.

3. With *E. dealbata* A. Cunn.

From *E. dealbata* it differs in having the secondary or mature leaves much darker in colour, and the intramarginal vein closer to the edge; the pedicels are longer, and the rim of the fruit rounded instead of truncate; the primary or juvenile leaves, too, are quite different from the glaucous ovate-lanceolate ones of *E. dealbata*, the timber of which is also more open in the grain, and of even less value" (C. Hall.)

Not only the juvenile but also the mature leaves of *E. dealbata* are broad, the type being a form exhibiting retarded development.

4. With *E. squamosa* Deane and Maiden.

"The buds are not unlike those of *E. squamosa* Deane and Maiden, but that is the only resemblance to this species" (C. Hall).

The two species are a good deal alike in habit. What I have said under *E. squamosa* in Vol. ii, p. 221 of the present work may be referred to. In the references there quoted *E. squamosa* and *E. Parramattensis* have been confused.

Their anthers and the broad juvenile leaves of *E. squamosa* sharply separate them. The fruits of *E. squamosa* sometimes have a rounded (pudding-basin) edge.

The seedlings of *E. squamosa* have cotyledons which I have provisionally described as "bisected"; those of *E. Parramattensis* are very different, being bilobed or reniform.

E. squamosa grows in ill-drained sandstone localities, locally elevated; *E. Parramattensis* grows in stiffer soils such as clay-pans.

5. With *E. resinifera* Sm.

"The hemispherical fruits might suggest *E. resinifera*, but the bark is smooth, and the timber quite distinct from that of this species, as is also the oil" (C. Hall).

Short operculum forms of *E. resinifera* have been confused with *E. Parramattensis*, and the general appearance of the fruits and leaves has contributed thereto. Indeed I received *E. Parramattensis* twigs from Auburn in 1888, and labelled them *E. resinifera* at the time.

The pudding-basin edge is common in this species as well as in *E. Parramattensis*. See Mueller's figure in "Eucalyptographia." Such an edge is seen on *E. resinifera* from south of Port Jackson to Fraser Island, Queensland, e.g., Bankstown and Cabramatta (J. L. Boorman); Mrs. Macquarie's Chair, Outer Domain (J. H. Camfield); Gladesville (J. L. Boorman); Hawkesbury district (A. Murphy); Fraser Island (W. L. Petrie).

It is very marked in the fruits rather larger than normal and with the capsule more sunk than usual from the Picton and Thirlmere districts (J.H.M.), and in the blunt operculum forms from the Blue Mountains showing some transit to *E. pellita* F.v.M.

6. With *E. propinqua* Deane and Maiden.

Plate 121, Vol. iii, may be referred to. *E. Parramattensis* has more hemispherical fruits, with the pedicels abruptly set on the calyx-tube; in *E. propinqua* the connection of calyx-tube is usually (but not invariably) more gradual. The pudding basin rim is often seen in this species.

The buds in the two species are small and rounded, and usually aberrant forms in the one can be matched by forms in the other.

The cotyledon-leaves and seedlings generally of the two species present considerable similarity, but the juvenile foliage of *E. propinqua* would appear to be broader than that of the other.

The author does not definitely state where his species should be placed, but I think its place is between *E. resinifera* and *E. propinqua*, inclining to the latter because of the comparatively smooth bark.

7. With *E. viminalis* Labill.

As has been already shown, Bentham looked upon this species as a form of *E. viminalis* (indeed several species were placed under that species, as they were only known from herbarium specimens), and Mueller followed him for a time. But there is no close relation, and that there was supposed to be an affinity is only drawn attention to, in this place, for completeness sake.

DESCRIPTION.

CLXIV. *E. Blakelyi* n.sp.

ARBOR erectiuscula, mediocriter alta, cortice leve, ligno rubro. Foliis juvenibus crassiusculis, pedunculatis, late ovatis vel fere ellipticis, obtusissimis, 7-10 cm. longis, 5-7 cm. latis sensim in petiolum angustatis, venis obscuris, vena peripherica a margine remota. Foliis maturis lanceolatis, falcatis, acuminatis, 7-18 cm. longis, 1-3 cm. latis, costa utroque latere conspicua, venis lateralibus numerosis, obliquis, irregularibus, vena peripherica a margine subremota. Pedunculis axillaribus, 1-15 cm. longis, umbellis non confertis 4-7 floris, pedicellis 3-7 mm. Calycis tubo turbinato, 3-4 mm. diametro, operculo cylindro-conico, 5-10 mm. longo. Antheris loculentis parallelibus. Fructibus fere globosis vel piro similibus formatis, in pedicellum angustantibus, valvis exsertis et plerumque subincurvatis.

A moderately erect medium-sized tree with smooth, more or less blotched bark, owing to the outer layer falling off in patches, timber red.

Juvenile leaves thickish, drying a pale grey or glaucous colour in contradistinction to the olive green of the mature leaves; pedunculate, broadly ovate or nearly elliptical, very obtuse, emarginate, or sometimes shortly acute, 7-10 cm. long (about 3 to 4 inches), 5 to 7 cm. broad, often somewhat oblique at the base, gradually tapering into the petiole. The veins often indistinct, the intramarginal one distant from the edge.

Mature leaves thickish, often somewhat shining or dull shining or glaucous, lanceolate, more or less falcate and acuminate, 7 to 18 cm. long (3-7 inches), 1 to 3 cm. broad. The mid-vein conspicuous on both sides, the lateral veins numerous, oblique and irregular, the intra-marginal one at some distance from the edge.

Flowers.—Peduncles axillary, terete or slightly compressed, 1 to 1.5 cm. long, bearing a loose umbel of 4-7 smallish flowers on pedicels of 3-7 mm. Calyx-tube turbinate, 3-4 mm in diameter, the operculum cylindro-conical, straight or slightly curved, 5 to 10 mm. long. Stamens about the length of the style, the inner row shorter than the outer one. Anthers small, somewhat cordate at the base, verging into truncate ovate; gland near the top, globular.

Fruit almost globular, somewhat attenuate at the base, or gradually converging into the pedicel 4-5 mm. in diameter, and about as long. The rim rather small, gradually narrowed towards the valves, the latter small and acute, but never spreading. The fruit, therefore, as a whole, takes on somewhat of a pear-shape.

Type.—Pilliga Scrub, 10-15 miles from Coonabarabran, towards Rocky Glen (Dr. H. I. Jensen, No. 129).

In honour of William Faris Blakely, one of my botanical assistants, who since 1915 has given me most intelligent assistance in my Eucalyptus work, and particular aid in the elucidation of the present species.

RANGE.

So far as has been worked out up to the present, this species has been found almost exclusively in New South Wales, the exception being the continuation of the New England table-land to Stanthorpe in Queensland.

In its typical form it is found in the drier north-western parts of this State, in the Pilliga Scrub, and it extends to the Western Plains. It also occurs on the Tablelands, both south and north, attaining a fair elevation. While it most frequently occurs in localities retentive of moisture, it is often found in better-drained situations.

NEW SOUTH WALES.

South and south-east localities.—Trees in the south and south-east, as follows, have uniformly small fruits and often small leaves :—

The Red Gum of the Tumut Flats, &c., also foot of Mt. Naughton (J.H.M. and J. L. Boorman). “Forest Red Gum.” Wolongawah, Tumut (W. A. W. de Beuzeville).

[Some flower buds are transformed into large galls by a small fly which Mr. W. W. Froggatt informs me belongs to the dipterous Family Agromyzidæ.]

Tree 50 feet high. Branches drooping and touching the ground. Kangiara, 14 miles north of Bowning (R. H. Cambage, No. 2,202).

“Red Gum.” Gundaroo (Rev. J. W. Dwyer, No. 4).

Western localities.—Cox’s River to Fish River and Sidmouth Valley; Bathurst to Sofala, mostly on granite country (R. H. Cambage and J.H.M.). Bathurst district (A. Murphy). “Mountain Red Gum.” Good timber, best in the district. Wiseman’s Creek, Bathurst (R. H. Cambage). “Red Gum.” “20-25 feet, almost globular in shape.” Juvenile leaves sometimes very large and flowering in that stage. Hill End (J. L. Boorman).

“Forest Gum.” Cowra (H. I. Jensen).

“Spotted Gum.” “Bark mottled, with a pink, brown and green appearance though very dull. Timber used for posts, very red. Height, 40-50 feet, girth, 2-3 feet.” Cargo (W. F. Blakely, No. 137).

“Ribbon Gum.” “Bark mottled green and white, branches mostly white, 60-70 feet, girth 4-5 feet.” Mt. Esk, Bowan Park, near Cudal (W. F. Blakely, No. 135, 136).

Borenore (H. Deane, No. 123).

Broadish leaves, Bumberry (J. L. Boorman). “Shrubby, rough base, branches with separating bark.” Bumberry (Dr. J. B. Cleland). “Red Gum.” Plentiful in low-lying lands, very stunted and faulty.” Stuart Town (J. L. Boorman).

"Red Gum." Dubbo (J. Duff). Midway near Dubbo (W. Gill and J. L. Boorman). "Cabbage Gum" without operculum, valves rather spreading. Minore (J. L. Boorman). Tomingley to Peak Hill (J.H.M.).

(These are the farthest westerly localities known to me.)

"Swamp Gum." "Large tall trees, trunk slightly ribbony, of a greyish yellow. Common in swamps." Capertee (J. L. Boorman, No. 8). "Red Box" or "Red Gum." "Tall straight trees of large dimensions, with thick bark of clean appearance, timber red and valuable. Sides of hills." Capertee (J. L. Boorman). Gulgong (J.H.M. and J. L. Boorman). Growing in low-lying places, large trees. Grattai, Mudgee district (J. L. Boorman and A. Murphy). Tambaroora, between Mudgee and Bathurst (R. H. Cambage, No. 2,786).

Between Cobborah and Merrygoen (W. Forsyth).

Till we get to Narrabri we are more or less in the Pilliga district :—

"30-50 feet. Scaly bark, which falls away in irregular patches, giving the stem a mottled appearance." Coonabarabran (J. L. Boorman). "Red Gum." "Trees of medium growth, smaller when grown on stony ridges, not of much service either for timber or fire-wood. Fruits rather larger than type. Timor Rock, Coonabarabran (J. L. Boorman).

"Cabbage Gum." Pilliga Scrub (Dr. H. I. Jensen); also 10-15 miles from Coonabarabran, towards Rocky Glen (Dr. H. I. Jensen, No. 129). The type. Borah Creek, 10-12 miles north from Rocky Glen (Dr. H. I. Jensen, No. 144).

Arrarownie, Borah Creek, 32 miles from Boggabri (Dr. H. I. Jensen, No. 150).

Boggabri. A thin, small-leaved form (J.H.M.).

Bugaldi, 16 miles from Coonabarabran (Dr. H. I. Jensen, No. 88).

Baradine (Dr. H. I. Jensen, No. 84).

Cuttabri (Dr. H. I. Jensen, No. 47).

"White Gum." On poor heathy lands. Mallallee, Pilliga Scrub (E. H. F. Swain, No. 31).

Ph. of Brigalow, Co. White, Narrabri district (E. H. F. Swain, No. 9). Narrabri (J.H.M.). Narrabri west (J. L. Boorman).

With very long opercula. Nundle, east of Tamworth, in swampy land (J. L. Boorman).

Walroodah, Barraba (R. D. Hay, Nos. 8 and 18). Bundarra, with pink and white filaments (Forest Assessor A. Julius).

"On the highest hills." Inverell and Tingha (J. L. Boorman, A. Julius).

QUEENSLAND.

"Red Gum." Stanthorpe (J. L. Boorman).

AFFINITIES.

This species has been arrived at by an application of the ordinary process of exhaustion employed in "running down" a species. The problem originally before one was to deal with an enormous amount of "*tereticornis*" material, and after weeding out certain species deemed to be valid by other botanists and myself, there remained a residuum which could not be properly placed (as I considered) in any of them. This residuum, collected from a very wide area, exhibits a form which seems to me sufficiently definite and useful, but one requires to do more collecting, and possibly to reject some of the specimens (especially some of the imperfect ones) quoted, before the species can be looked upon as the finished article—if there ever is one such, particularly in this protean genus.

It belongs to the *E. tereticornis* group, and to that section of it with broad juvenile leaves.

1. With *E. tereticornis* Sm.

It differs in its thicker foliage, both juvenile and adult;—particularly the former, in the smaller, and more pear-shaped (clavate) fruits, in the thinner texture of the fruits, and in the smaller and narrower buds.

The foliage of *E. Blakelyi* is much thicker than that of *E. tereticornis*, and is of a glossy olive green, the young branches are also more highly coloured than those of *E. tereticornis*—a matter of environment.

E. Blakelyi is a medium sized tree, usually much smaller than *E. tereticornis*, and, in its typical form, with drooping branches almost to the ground, and in habit resembling more closely *E. melliodora* A. Cunn., than *E. tereticornis*, which is more erect. The bark is more mealy and mottled, and rarely smooth or clean stemmed as *E. tereticornis*.

2. With *E. amplifolia* Naudin.

The juvenile leaves of *E. amplifolia* are coarser, less petiolate, less gradually contracted towards the petiole. The flowers of *E. amplifolia* are more than twice as numerous in the umbel.

The buds of *E. amplifolia* are more stellate in appearance, are of less diameter, more falcate, and the rims, marking the deciduous character of a second operculum on each bud, more accentuated.

3. With *E. dealbata* A. Cunn.

Some forms of *E. dealbata* lose their glaucousness and may turn olive green in colour as does often the foliage of *E. Blakelyi*, but the leaves of *E. dealbata* are more rigid and usually much smaller.

The operculum of *E. dealbata* is conical and almost invariably shorter than that of *E. Blakelyi*. The latter never flowers in the juvenile-foliage state.

DESCRIPTION.

CLXV. *E. dealbata* A. Cunn.,

Ex Schauer in Walper's *Repertorium* ii, 924 (1843).

FOLLOWING is a translation of the original :—

Entirely glaucous-pruinose, with rigid, terete branches, leaves coriaceous, ovate or elliptical, oblique at the base, contracted into the petiole, veins acute in the adult stage, pale and opaque, with pellucid dots; peduncles axillary, flowers subsessile, terete; petioles rather short; pedicels angular, equal in length to the calyx-tube; operculum membranous, acutely conical; calyx-tube shortly cup-shaped, twice as long, and less in breadth. Length of leaves, 3-3½ inches, 1-1½ inches broad, petiole scarcely an inch long; the operculum about three lines long.

In the interior parts of New South Wales, in the neighbourhood of Wellington Valley.

The type specimen was obligingly lent to me by the Director of the Vienna Herbarium in 1901, and Miss Flockton made an excellent drawing of it. It is in full flower, but all the leaves are in the opposite-leaved stage. The leaves are broad (4-5 cm., and about twice as long), and one and part of a second, together with a rounded conical operculum, have been figured at 3a, Plate 134. The fruit has a sharpish, flat rim, with well exerted valves.

In B. Fl. iii, 239 the species is described in English.

In the "Eucalyptographia" Mueller did not figure it, as he looked upon it as "merely an abnormal state of *E. viminalis*."

Where you have a scraggy small tree, as *E. dealbata* normally is, growing in exposed situations, it is not surprising that, under improved conditions of shelter and soil, a good deal of variation may result. It may be mallee-like or grow into tall trees, but usually it is not a symmetrical, but a stunted plant. The bark falls off in flakes or small ribbons. The tree is never quite smooth; there is always a certain amount of rough, untidy bark at the butt.

The young branchlets may be angled, but this is not an invariable character.

The whole plant is most commonly glaucous or dealbate (*dealbatus*, whitened or white-washed), but there are all stages to merely dull and perfectly glabrous.

One's first impression, on examining the type, is that of a species which "never grows up," or is isoblastic, for it flowers in the juvenile stage, but a little experience shows that while it is normally a broad-leaved species, often flowering in that state, it often assumes the lanceolar-leaved form, affording an instance of retarded heteroblasty. In this respect it can be compared with such species as *E. cinerea* F.v.M., *E. Risdoni* Hook. f., and *E. gamophylla* F.v.M.

Normally its leaf-venation is well marked, and its texture thickish, but these both vary.

The buds are conoid in the type, but while the operculum never attains the size it may do in *E. tereticornis*, it may be shorter or longer or blunter than in the type.

The length of the pedicel varies; sometimes it is absent.

While the rim of the fruit is normally flat and a little sharp, it may be as sharp as in *E. rostrata* and as hemispherical, and this is the species to which it is perhaps most closely allied. As a consequence, and particularly when found in good soil, its fruit often is near to that of *E. rostrata*. Sometimes, in arid country, growth may be arrested, and we may have a very small fruit in *E. dealbata*. While the flat or horizontal is very common in the species, there are various degrees of transition between this and the domed fruit which attains a much greater development in *E. tereticornis*.

SYNONYM.

E. tereticornis Sm. var. *dealbata* Deane and Maiden in *Proc. Linn. Soc. N.S.W.*, xxiv, 466 (1899).

Note 1.—Bentham states that Mitchell's specimens (which I have not seen), referred by Black in *Journ. Linn. Soc.* iii, 92, "to *E. tectifera* belong to *E. dealbata*, the leaves of which sometimes assume the form of those of *E. alba*, but with a different venation." (B. Fl. iii, 243, under *E. alba*).

The reference is to Mr. Allan Black, Curator of the Hookerian Herbarium (*op. cit.* p. 81). Mitchell's specimens ("N. Holl. sub-trop.") were collected probably in northern New South Wales, but no number or locality is given.

Note 2.—"It is possible that this (*E. dealbata*) may prove to be the true *E. pallens* DC." (B. Fl. iii, 239). For the confusion which has gathered around *E. pallens*, see Vol. i, p. 57 of the present work, and also pp. 20, 21 and 275 of Vol. ii. I would not revive it as a species-name to take priority.

RANGE.

Although it has not been recorded for any other State other than New South Wales, it has been found so near to the Victorian and Queensland borders, that it seems highly probable that it will be found in those States. The type came from the Wellington district, and it occurs on both the southern and northern table-lands, and even more extensively on the Western Slopes, and also to a considerable extent on the Western Plains, chiefly to the north and south.

"Smooth whitish bark, 50-100 feet, growing in Albury, near the Murray; called Red Gum (*rostrata*), but trunk rougher, bark falling in strips on upper limbs." Very close to *E. rostrata*, but buds and fruits not quite normal, showing some affinity to *E. dealbata*. It is placed here to emphasise the affinity of these two species. (Rev. J. W. Dwyer, No. 109). Broadish lanceolate leaves, branchlets free growing. Doubtless similar to the preceding. Albury (R. T. Baker).

Leaves lanceolate; trees of medium size. Experiment farm, Bomen, near Wagga Wagga (R. Helms; J.H.M.). Some with broader leaves on the Farm both on the granite hills and on the flats (Dr. H. I. Jensen).

A pedicellate form, in fruit only, which, in my view shows transition between *E. dealbata* and *E. rostrata*. Carabost, Tumbarumba (R. H. Cambage, No. 1,015).

"Fairly robust trees, not tall, about 30 feet high, in cold exposed places. Bark flaky and falling away in pieces." Leaves broadish to lanceolate. Tumut (J. L. Boorman). With mostly long, lanceolate leaves, but some shorter and broader. Opercula very attenuate. Tumut (J.H.M. and J. L. Boorman). "Fairly tall trees on stony ridges at high altitudes. Bark generally bluish white, but patchy in appearance, giving the stems a mottled appearance." Leaves lanceolate. Gilmore, near Tumut. (J. L. Boorman). A very drooping gum, resembling a Weeping Willow. Lanceolate to broadish leaves. Apparently growing in favourable conditions. Tumut (Forest Ranger Meecham).

"White Gum." Broadish leaves. Adelong Crossing (Rev. Dr. Woolls).

Queanbeyan. Lanceolate leaves and narrow fruits. Showing some transit to *E. tereticornis* (Henry Deane, No. 407; J. L. Boorman) Federal Capital Site, Queanbeyan, with the insect galls (dipterous family Agromyzidæ). Lanceolate leaves. Beaked opercula (R. H. Cambage, No. 2,936). Acton Paddocks, No. 14. Mount Stromlo, No. 12. Both lanceolate leaves. "Blue Gum," Hospital Ridge, Canberra. No. 22. Broadish leaves with above insect galls. All three from Federal Territory (C. Weston).

Gundaroo. Buds with the usual galls (Rev. J. W. Dwyer. No. 15). Yass (Rev. J. W. Dwyer, No. 62). Same as preceding. (No. 2 shows variation).

"White Gum." Coarse, broadish, long lanceolate leaves. On flats, Bowning (A. Murphy).

"From the Forest Reserve on which Mr. Colemane (Eucalyptus oil manufacturer) originally operated."

Mr. Murphy says that Mr. Colemane used to fell this tree for Eucalyptus oil, and would not fell the *E. tereticornis* alongside.

T. S. & C. Rs. 44,220 and 44,221 in County of Harden, about 2½ miles from Bowning Railway Station, called "Blue Gum" locally. "A moderate sized tree up to about 3 feet in diameter, and grows to a height of about 75 feet, and does not produce a long bole; a 30 feet log would be rare. It is a most durable timber for bridge-work, fencing, &c." (District Forester Williams).

Yamma Creek. Muttama Station, Cootamundra to Gundagai (G. Singleton). Leaves lanceolate to broadish. Cootamundra (W. D. Francis).

Near Yanco, on sandstone range, lanceolate leaves, and *E. rostrata*-like buds (Dr. J. B. Cleland, No. 31, &c.).

Leaves lanceolate to somewhat broader. Temora (Rev. J. W. Dwyer, Nos. 112, 251, 499). "A gum, smooth deciduous bark, dark grey or greenish and bluish on trunk, but creamy on branchlets, about 20 to 30 feet high." Road, Temora to Mirrool (Rev. J. W. Dwyer). Leaves lanceolate. Temora to Morangarell (Rev. J. W. Dwyer, No. 136).

"Like *E. tereticornis* somewhat, but the bark shells off and hangs on trunk. It is about 50 feet high." Ironbark sedimentary ridge near Barmedman (Rev. J. W. Dwyer, No. 479b, &c.). "Red or Cabbage Gum." Barmedman on ridge. Leaves lanceolate (R. H. Cambage).

Leaves lanceolate. Wyalong (W. S. Campbell).

Ardlethan on quartzite ridge. Leaves of medium width (R. H. Cambage, No. 4, 192).

"A gum for the most part very irregular, in many cases having three or more stems. The highest about 60 feet, but mostly about 30 feet. Grows only on the rocky rises and hills. Bark cream to almost white, loose and coarse at the butt. Does not appear to be used for any purpose here." Lanceolate leaves. Bynya, Barellan (W. Burke).

Lanceolate to broadly lanceolate leaves. Weddin Forest Reserve, *viâ* Young (J.H.M.).

"Stunted form of Forest Red Gum, with rounded opercula." Grenfell road (R. H. Cambage). "Mountain Gum." Lanceolate leaves. Also "Forest Gum." Grenfell (District Forester Arthur Osborne, No. 47).

"This tree is called Cabbage Gum on account of its small size and crooked, stunted shape. It is most difficult to get a straight log (either from branch or trunk) of even 4 feet in length. The bark is smooth and grey, similar to the Red Gum (*E. rostrata*) both on trunk and limbs—in fact, the whole tree appears to be the Red Gum in miniature, except that it does not grow straight. It is sometimes used for posts for fencing when no other timber can be obtained, such as on rocky hills, where it is generally found, and where carting other kinds is difficult. It makes good charcoal." Leaves broadly lanceolate. (Forester Postlethwaite, Grenfell).

"Blue Gum." Cowra district (Forest Ranger Stevenson). Mt. McDonald, Cowra district, also top of Bluff. Valves very exsert (J.H.M. and J. L. Boorman). Noyéau, Woodstock (G. W. Hammond). Lyndhurst (A. W. Howitt). Mt. Macquarie, near Carcoar (J. L. Boorman). Manildra (J. L. Boorman). Two very different forms, one with narrow leaves, the other with a longer operculum and much broader leaves.

With long operculum, Bowan Park, near Cudal (W. F. Blakely, No. 197). "Red Gum." Broadish leaves. Ophir, Orange. Affinity to *E. rostrata* (R. H. Cambage). Bogan Gate (J. L. Boorman). Forbes district (Henry Deane, No. 129). Bogandilla, Condobolin (W. W. Froggatt). "One of the Red Gums of the district, growing on the tops of the stony hills near the township; the whole of the inflorescence has a yellow hue." With very short opercula. Condobolin (J. L. Boorman). Slopes of Mt. Tyriga, Condobolin-Euabalong road; reputed to be the centre of New South Wales. This is a tree, which, if found growing in the Sydney district would, as regards its bark, be judged to be *E. punctata* DC. (J.H.M.).

Hill of fine grained granite, Bullock Creek, 20 miles north west of Trundle. With short, almost rounded opercula. It shows affinity to that species in the opercula, but less in the fruits (R. H. Cambage, No. 1,013).

Dubbo (J. L. Boorman). The common gum of the district, found on both low and high lands, stunted on the tops of the Range. Often Mallee-like. Harvey Range (J. L. Boorman; J.H.M.). Dubbo to Tomingley (J.H.M.). Sandstone ridge, Mudgee road, 4 miles from Dubbo. (R. H. Cambage, No. 1,063).

Dubbo, Peak Hill and Harvey Range (J.H.M.). A scaly, half-barked tree, but sometimes with bark as smooth as normal *tereticornis*. The amount of scaly bark varies a good deal. Tree strikingly like Mr. Postlethwaite's "Cabbage Gum." Buds markedly yellow.

Eremeran, Dandaloo (Forest Ranger Kidston). Buds arranged in form of a rosette or star, like those from Mt. Boppy and some other western localities. Mr. Kidston, a very experienced observer, labels it "Stunted Gum, grows on stony ridges, allied to Mallee."

These three specimens from the same district will give some idea as to how variable it is :—

1. "Gum," "Red Gum," "Cabbage Gum." "Grows to an average sized forest tree 2 or 3 feet in diameter, very common, and mostly in sandy soil." *Gilgandra* (L. C. Irby).
2. "Gum," "Cabbage Gum." "As seen are small bushy trees up to about 1 foot in diameter, and 15-20 feet in height." *Gilgandra* (L. C. Irby).
3. "Gum," "Red Gum," "Cabbage Gum." "This form might be termed a Mallee Gum, i.e., several stems growing from the ground in a clump, and is usually very glaucous. In the same locality it will be seen as a small tree, and also near by growing with several stems after the nature of Mallee." *Gilgandra* (L. C. Irby).

Gundong or Quandong Creek, a tributary of the Bogan (Rev. G. A. C. Innes).

Mt. Hope (J. L. Boorman).

Growing in Mallee form, eight or ten stems from one root, and about 20 feet high. Wirlong Copper Mine, Nymagee (R. H. Cambage, 1,011, see *Proc. Linn. Soc. N.S.W.*, xxvi, 204). Nymagee (J. L. Boorman).

"Red Gum," Byrock (R. H. Cambage); the buds are arranged in the form of a star.

On igneous hill near Mt. Boppy, the most north-western locality from which Mr. Cambage has collected it.

Bathurst (J.H.M.; Dr. H. I. Jensen). George's Plains, near Bathurst (J.H.M.). With thick, grey, box-like bark. Perth to Apsley (J. L. Boorman).

"A stunted tree, 15-20 feet high, in barren rocky situations between Wellington Valley and Croker's Range. November, 1828." This is a copy of a label, in Allan Cunningham's handwriting, on a type specimen from the Hookerian Herbarium, presented by Kew to the National Herbarium, Sydney, April, 1901.

"Croker's" is in *Wells' Gazetteer* (1848) defined as "Native name Warre; a range of mountains situated in the district of Wellington, between Goobang Creek and the river Byrne." Croker's appears to have dropped out of modern maps; Goobang Creek flows near the modern Parkes.

"Clean bark, somewhat mallee-like." Fruit with a sharp rim, reminiscent of *E. rostrata*. Wellington (Dr. J. B. Cleland). "Grey Gum of Merrindee, between Wellington and Mudgee, on low flats." (A. Murphy). Capertee, nearly typical (J. L. Boorman).

"Tall, umbrageous trees, 50-80 feet high, with large boles of sound timber. Growing on flats and stony ridges throughout the district. With long pedicels. Foliage coarse. A form intermediate between *E. dealbata* and *E. tereticornis*. Hargraves (A. Murphy and J. L. Boorman).

Stunted Gum on the hills near Mudgee (Rev. Dr. Woolls). One of the so-called White Gums from the neighbourhood of Bathurst and Mudgee (see further notes in Woolls' *Flora of Australia* p. 228). Mudgee (A. G. Hamilton, No. 53). Barrigan Ranges, Bylong (R. T. Baker) and Two Mile Flat (? 31 miles from Mudgee) (Rev. Dr. Woolls). Lanceolate leaves and large buds, a robust form.

"Creek Gum." Eight miles past Dunedoo, along railway line, in damp situations. Longish leaves, free growing, doubtless because of favourable conditions. Not quite normal. (A Murphy).

Timor Rock, Coonabarabran (J. L. Boorman). "Small plants of less than 20 feet high, growing in cold, exposed places, the plants forming large shrubs rather than small trees, having no leading stem. In company with *Acacia triptera*." Coonabarabran (J. L. Boorman). Top of Nandi Hill, near Coonabarabran. Practically all the leaves of this specimen short and broad, or on the broad side, but a few on the tips of the branches narrow. Flower-heads dense. An interesting mountain form (W. Forsyth).

(a) "Silver-leaved Gum with blue bark peeling off at base."

(b) "Ironbark (*sic*), grey bark, furrows not deep, fibrous."

Both specimens with longish, broadish leaves, evidently from similar trees, although the fruits of (b) are inclined to be more elongated. Bugaldi, 8 miles from Coonabarabran (Dr. H. I. Jensen).

"So-called Yellow Box. Rough bark to topmost branches, not unlike Stringybark in bark and leaf. Occurs usually in association with Black Pine on very sandy soil. On red sandy loam, good wheat land. The true Yellow Box (*E. melliodora*), often has a ragged, variable bark, and it is not unusual, particularly in northern New South Wales, for other species to be confused with it. Some of the long, broadish leaves of No. 74 are more or less triplinerved, which helps the delusion. Baradine" (Dr. H. I. Jensen, No. 74). "This Gum has a spotted or smooth bark; large tree, with large (broadish, J.H.M.) leaves and broader sucker leaves. Accompanies Pine, Apple, Box, on good red sandy wheat land. Baradine" (Dr. H. I. Jensen, No. 8). Lanceolate leaves. On the plains near Baradine (W. Forsyth).

"Small trees of about 20-30 feet. Flaky bark coming away in patches. The whole plant of a mealy whiteness. Timber red, exceedingly faulty, subject to white ants. With short, moderately broad-lanceolate leaves." Cuttabri, Pilliga Scrub (J. L. Boorman). "A tree showing the character of *E. dealbata* in the fruits, but in texture of leaf and shape of buds, *E. rostrata*. It appears to me to be a link between the two species. Tall trees growing in the bed of the Cuttabri Creek, and known as Red Gum." Undoubtedly a specimen showing transition between the species named. A free-growing specimen, to be attributed to the favourable conditions. Cuttabri, Pilliga Scrub (J. L. Boorman). Cuttabri (Dr. H. I. Jensen).

With rounded opercula, in this respect reminiscent of *E. Bancrofti*, but the fruits mostly smaller. Warrumbungle Ranges (W. Forsyth, No. 3).

-Specimens from the Warrumbungle Ranges vary not a little amongst themselves. In some the leaves are short, the fruits are sometimes nearly sessile, and others have the valves scarcely exerted. One specimen (found along creeks), has the fruits very similar to *E. rostrata*, but the opercula are rather those of *E. dealbata*. Some of the fruits are pale brown and shining.

Pilliga Scrub. With broadish lanceolate leaves. (Dr. H. I. Jensen, No. 67b). "Mallee." Lanceolate leaves. Poor heathy land, south-east Pilliga (Forest Guard E. H. F. Swain).

"Gum in scrub on McIlbrick's Settlement Lease, Ph. Willurie, Co. Nandewar," (Gunnedah district, Forester M. H. Simon). "Gum to 20 feet high, growing in creek on Donnelly's Improvement Lease. Ph. Mihi, Co. Nandewar. Leaves short, lanceolate to broad-lanceolate. (Forester M. H. Simon).

"White Gum, 4 feet, girth, 30 feet high, branches from near ground." Mullaley, Ph. Nombi, Co. Pottinger. Leaves lanceolate to broad-lanceolate, not very long (Forest Guard M. H. Simon, No. 107). Lanceolate to broad-lanceolate leaves. Girth, 5 feet. Height, 40 feet. Settlement Lease 63 (Brett's). Ph. Wondoba, Co. Pottinger (Forest Guard M. H. Simon, No. 125).

"White Gum, a tall tree, white smooth bark, on sand-ridge." Ph. Boroo, Co. Benarba. Lanceolate leaves; intermediate leaves broad and long. (E. H. F. Swain, No. 18).

"Gum, with box trunk. Arrarownie, Borah Creek, 32 miles from Boggabri. Lanceolate leaves. (Dr. H. I. Jensen, No. 147).

Short lanceolate leaves. Baan Baa (J. L. Boorman).

"Red or Cabbage Gum." Narrabri (Forest Ranger McGee). Narrabri West. Both with lanceolate leaves (J. L. Boorman). "Locally called Mallee. Growing in isolated patches amongst Curracabah scrub (*Acacia Cunninghamii*) on sandstone country with clay subsoil." Stiff plant, lanceolate leaves, Ph. Milner, Co. White, Narrabri district (E. H. F. Swain, No. 10). Also from Ph. Milner, but with broader

leaves and much freer growth (E. H. F. Swain). About 8 miles W.S.W. of Narrabri, Pilliga Scrub (Dr. H. I. Jensen, No. 8). Lanceolate, thickish leaves. "Yellow Gum," (*sic*) Rocky Creek, Narrabri District (E. H. F. Swain, No. 22). Short broadish leaves. Another instance of the yellowness this species often assumes in the Pilliga district.

"Red Gum. Large tree, 60-70 feet, 8-10 feet girth. Bark grey in colour and smooth. Sandy soils." Wee Waa. Lanceolate leaves, evidently a free-growing specimen. (T. W. Taylor, Forest Guard, No. 32).

Stunted Gum, 20 feet high, short conical opercula, short broad and narrow lanceolate leaves. Ph. Duckhole, Co. Courallie (Forest Assessor E. Julius).

Lanceolate leaves, fruits a little pear-shaped. "Growing like Mallee, on sandstone, top of mount near Shale Mine, Baerami, west of Denman." (R. H. Cabbage, 2,687). Denman, short leaves (W. Heron, No. 22). Lanceolate leaves. Merriwa (J.H.M. and J. L. Boorman). Lanceolate leaves, venation well marked. Murrurundi (J.H.M. and J. L. Boorman). Lanceolate leaves, with intermediate leaves broad. Currabubula (R. H. Cabbage, No. 3,551).

"Silver Leaf Eucalypt. Bark on trunk resembles that of *E. rostrata*. Cleans into bright yellow bark half-way up. All limbs pendulous and gnarled. 25-30 feet." Very large, handsome, long markedly veined leaves. Linton Forest Reserve, 16,098, Barraba district (W. A. W. de Beuzeville, No. 5). No. 6 from the same place has shorter, smaller leaves with buds in a young state, with a double operculum to every bud.

Lanceolate leaves. Warialda (E. J. Hadley, No. 22). "White Gum." A low stunted tree. Leaves short and ovate. Warialda (W. A. W. de Beuzeville). Hills about Warialda (J.H.M.). "White Gum." Coolatai, Warialda district. Leaves broadish lanceolate. (W. A. W. de Beuzeville). With large broadish, well veined leaves. Ashford (J. L. Boorman).

Lanceolate to broadly lanceolate leaves. Juvenile leaves pedicellate and nearly circular, with spatulate base. Branchlets angular. Rims of fruits very sharp and to some extent resembling those of *E. rostrata*. In swampy land, Tingha. Inverell district (J. L. Boorman). Howell and Inverell to Howell (J.H.M., J. L. Boorman, and E. C. Andrews). Inverell (Forest Assessor A. Julius, No. 8). With leaves lanceolate to broadly lanceolate. Broadish leaves. Between the Gwydir and McIntyre Rivers (District Forester E. H. F. Swain).

"Brown-barked Gum." "Elvanite soils, accompanies Box, Dogwood (*Jacksonia scoparia*) and a little grass-tree." Narrow to broad leaves. New England (See Christie in *Proc. Roy. Soc. N.S.W.*, xi, p. 32 (1877)).

"Tree of 30-40 feet. Bark corrugated and very hard, but not very rugose, separating in small pieces $\frac{3}{4}$ -inch thick." Small narrow lanceolate leaves, and nearly sessile buds. New England (C. Stuart). Labelled at various times by Mueller "*E. dealbata*" and "*E. viminalis* var." and doubtless one of the specimens which led him to look upon these as conspecific.

AFFINITIES.

1. With *E. rostrata* Schlecht.

E. dealbata certainly connects in foliage, buds, and to some extent in fruits, with this species. The interior blunt budded forms of *E. rostrata* are sometimes especially difficult to separate from *E. dealbata*, and that species may be proved to occur nearer to the centre of Australia than is usually supposed.

In dealing with individual specimens of *E. dealbata* I have oftener referred to *E. rostrata* than to any other species, and the relations of these two will be again referred to when *E. rostrata* is reached in Part xxxiii.

2. With *E. tereticornis* Sm.

There is undoubted affinity between *E. dealbata* and *E. tereticornis* and allied forms, as examination of the plates in Part xxxi will show. *E. tereticornis* never flowers in the broad-leaved stage, nor is it ever glaucous, as *E. dealbata* habitually is. Oil-distillers sometimes use the leaves of *E. dealbata* for oil, but say there is "no oil" (not literally true) in the leaves of *E. tereticornis* alongside. At the same time the two species do not usually occur together. Speaking generally, *E. dealbata* belongs to the comparatively short operculum series, while *E. tereticornis*, *E. Bancrofti*, and *E. amplifolia* have long opercula. In the species with long opercula the stamens may be arranged straight; in *E. dealbata* the filaments are bent.

3. With *E. viminalis* Labill.

"F. Mueller thinks it (*E. dealbata*) may be reducible to a variety of *E. viminalis*." (B. Fl. iii, 239).

"*E. dealbata* seems merely an abnormal state of *E. viminalis*, standing to it in the same position as *E. pulverulenta* to *E. Stuartiana*, as *E. Risdoni* to *E. amygdalina*, as *E. melanophloia* to *E. crebra*, and to some extent as *E. cordata* to *E. urnigera*." (Mueller in "Eucalyptographia" under *E. viminalis*). In other words, that *E. dealbata* and *E. viminalis* are geminate species.

I cannot understand how Mueller came to adopt this view, as the two species are by no means close to each other.

E. viminalis is a very large tree of low-lying land and with pale-coloured timber; *E. dealbata* is a smaller tree, with usually rougher bark and with red timber. *E. viminalis* has conspicuously narrow juvenile foliage, while *E. dealbata* has just the opposite. There are also differences in buds and fruits. Compare Plates 117-119.

DESCRIPTION.

CLXVI. *E. Morrisii* R. T. Baker.

IN *Proc. Linn. Soc. N.S.W.* xxv, 312 (1900), with a Plate.

FOLLOWING is the original :—

A Mallee of rather dense growth, or somewhat spreading, usually about 15 feet high or somewhat higher; stems 2-3 inches in diameter; rarely growing to tree-size, about 25 or 30 feet high and 6 to 12 inches in diameter. Stems mostly hollow. Branchlets often flattened or quadrangular. Bark grey, somewhat fibrous, or on very old trees even furrowed, approaching that of an "Ironbark."

Timber.—A hard, close-grained, interlocked, brownish-coloured, durable timber, quite distinct from that of *E. viminalis* Labill., and *E. tereticornis* Sm., its allies.

Young leaves petiolate, generally lanceolate in form, sometimes narrower and sometimes broader than the mature ones; opposite or with a tendency to become so. Mature leaves lanceolate-acuminate, on petioles of about 1 inch long, occasionally falcate; about 6 inches long and up to 1 inch wide; not shining, venation spreading, very prominent on both sides, intramarginal vein removed from the edge. Oil glands numerous.

Peduncles axillary, not numerous, flattened and twisted, short, under six lines, mostly 3-4 lines long, bearing 3 to 7 shortly pedicellate or sessile buds (mostly in threes). Calyx-tube hemispherical, 3 lines in diameter. Operculum obtuse, conical, 3 lines long. Ovary domed. Anthers parallel, connective not prominent.

Fruits hemispherical, rim pyramidal and sometimes twice the length of the calyx, valves well exerted, 3 to 4 lines in diameter, shining.

It is a remarkably constant and well-defined species throughout the area of its distribution.

It is named after R. N. Morris, LL.D., the present Superintendent of Technical Education in New South Wales, in acknowledgment of his co-operation in our work on the economics of the genus *Eucalyptus*.

"Grey Mallee," and Mr. W. Baeuerlen is quoted as saying that this Mallee is also called "Black Mallee," as well as "Cabbage Mallee," the latter said to refer to the soft wood.

The leaves are conspicuously black-dotted like *E. punctata* DC. and some others. I have collected it showing the scars of the double opercula on individual buds. My observations on the broad rim of this species will be found at p. 58.

RANGE.

Mr. Baker quotes Mr. Baeuerlen for the following statements :—

"Near Girilambone, on stony or rocky hills, thence on hills across country to Cobar; also near Coolabah, where it occurs on more or less level and less stony ground. . . . It attains not its greatest height, but certainly its greatest diameter, on the highest hills amongst the roughest and rockiest parts. . . . This species is a Mallee of the northern (*sic*) interior of this colony, where it is found associated with the "Green Mallee" and at times with *E. oleosa*."

It is confined to New South Wales, and so far it has only been recorded for a very limited area in the Western Plains. This may be defined as the triangular area made by the Bourke and Cobar lines which junction at Nyngan. The third side of the triangle joins Cobar with Coolabah, or rather the shape is a quadrilateral, as it must join a point 38 miles north of Cobar.

Following are the specimens represented in the National Herbarium of New South Wales :—

“Grey or Black Mallee.” Girilambone (W. Baeuerlen). The type.

“A low growing tree with a wide-spreading habit. It is not strictly speaking a Mallee. (I would call it a Mallee, although it attains an unusual size, J.H.M.). It seldom attains more than 20 feet high; it is often much less. The bark is ribbony, of a thick texture, falling away in flakes, which are of a blackish colour; the ends of the branches are rough,” Girilambone (J. L. Boorman). Juvenile foliage narrowish. Young and adult foliage lustreless. Girilambone Hill (J.H.M. and J. L. Boorman).

“Narrowish juvenile foliage. Mostly a tall Mallee, but seen up to 30 or 35 feet, with a hard, black, flat-fissured bark, up to the ultimate branchlets. One foot in diameter up to 1 ft. 9 in.” Coolabah (J.H.M.)

“Bark rough to tips.” Mount Boppy (J. L. Boorman).

Cobar (correspondent of Rev. Dr. Woolls prior to January, 1887). Thirty-eight miles north of Cobar (R. H. Cambage). Some fruits smaller and with flatter rims aff. *E. exserta* F.v.M.

AFFINITIES.

1. With *E. tereticornis* Sm.

“Perhaps the most remarkable specific character about it is the rim of the fruits. The word “domed” hardly expresses correctly this feature, for merging into the valves at the top it forms as it were a truncate cone resting on the hemispherical calyx base. This conformation of the rim is noticeable as soon as the stamens begin to fall off, and from this stage until and after its full development, it gives the appearance to the fruit of a pathological affection or a monstrosity. The shape of the fruits, however, is remarkably constant throughout the extensive (*sic*) range of the species. It is, so to speak, the rim of *E. tereticornis* Sm., only very much more emphasised.

“This Eucalypt differs, however, from that species in the venation and texture of its leaves, shape of operculum, chemical constituents of its oil, as well as in the timber and bark. In botanical sequence it is placed next to *E. tereticornis* Sm.” (R. T. Baker.)

Its narrow juvenile leaves, and its brown timber sharply separate it from *E. tereticornis*. Its affinity is with *E. exserta* F.v.M.

2. With *E. exserta* F.v.M.

I already drew attention to these species in *Proc. Linn. Soc. N.S.W.* xxix, 774 (1904), and while I think that this is the species closely related to *E. Morrisii*, the latter should be kept separate. Under *E. exserta* I have drawn attention to the rim in this species (*ante* p. 33 footnote) and have noted that it is capsular, and is not a part of the calyx-tube. That of *E. Morrisii* is an exaggerated example of what we see in *E. exserta*, and figure 6c, Plate 135, and figure 7a, Plate 132, may be compared. While the rim and the valves are structurally portion of the capsule in both cases, in the case of *E. exserta* there is greater demarcation between them than is ordinarily the case in *E. Morrisii*. In some smaller fruited specimens of *E. Morrisii* the demarcation is as marked as in *E. exserta*.

The two species have brown, not red timbers, and both roughish bark, that of *E. exserta* being the rougher.

While they have both narrow juvenile foliage, that of *E. Morrisii* is more rigid than that of *E. exserta*, indeed rigidity is a proper word to apply to the habit of the former species, and flexibility to the latter. The difference in size of the two species is not as great as was at one time supposed, and their relations are interesting.

3. With *E. santalifolia* F.v.M.

"The buds, especially the operculum, resemble those of *E. santalifolia* F.v.M., from which species, however, the venation of leaves, and mature fruits differentiate it." (R. T. Baker.)

The reference is really to *E. pachyloma* Benth., and having studied this species in the field in Western Australia since my references to it in Part VII of the present work, I will postpone comparison of that remarkable rimmed species with *E. Morrisii* until I separately deal with *E. pachyloma*.

4. With *E. viridis* R. T. Baker.

"Mr. W. Baeuerlen, who was the first to collect *E. Morrisii*, states :—"This species, also a Mallee, grows in the same way as and associated with Green Mallee, *E. viridis* R.T.B.; but the leaves are so different in colour, &c., as to distinguish it at once. The bark is much the same, but persistent often right out to the branches; at other times smooth nearly half-way down. The persistent bark is rougher and more furrowed, in the larger trees, making a slight approach to the Ironbarks. In the crosscut it is red or brown, quite different from *E. viridis* R.T.B., and the buds, flowers, and fruit are totally different." (R. T. Baker.)

5. With *E. viminalis* Labill.

"The expanded valves are similar to those of *E. viminalis*, but this is its only connecting link with that species" (R. T. Baker), but under "Timber," spoken of as "*E. viminalis* and *E. tereticornis*, its allies."

E. viminalis is a large white or Ribbony Gum with pale, soft timber and a denizen of river banks and swampy places in cold localities, a direct contrast to *E. Morrisii* in all these respects.

DESCRIPTION.

CLXVII. *E. Howittiana* F.v.M.

IN Wing's *Southern Science Record*, ii, 171 (August, 1882).

FOLLOWING is the original :—

Branchlets angular.

Leaves on stalks of moderate length, scattered, ovate or elongate-lanceolar, dark-green above, much paler beneath, of rather rigid consistence; their lateral veins pinnately spreading, numerous, very subtle, the circumferential vein at a slight distance from the edge; oil-pores concealed.

Panicles axillary and terminal, their ultimate branchlets rather stout, short, angular, bearing generally 3-6 flowers without any separate stalklets.

Fruits very small, ovate-globular, truncated, quite smooth, somewhat shining, distinctly contracted towards the narrow terminal margin; valves 3-4, minute, almost deltoid, inserted near the orifice.

Sterile seeds extremely short.

Fertile seeds very small, almost ovate, neither considerably angular nor provided with any membranous appendage.

Flowers unknown.

A little later, Mueller secured flowers and he figured the species in Part 9 of the "Eucalyptographia" and gave some additional notes.

The following paragraph is practically all new :—

"A tree, attaining a height of about 100 feet, and at the basal butt a girth of 12 feet. Bark less fissured than that of the so-called Box-Eucalypts, more resembling that of the Stringy-bark trees. Wood, however, much like that of the former, but its fibres not quite so interwoven, hence easier to split. Foliage throwing great shade (Inspector Stafford). Leaves 2-5 inches long, $2\frac{1}{2}$ inches broad, gradually pointed, usually not much curved, with an oily lustre on the surface, not shining underneath; their reticular veinlets very subtle; their stomata developed on the underside only. Panicles not very ample, from $1\frac{1}{2}$ to 6 inches long. Tube of the calyx slightly angular; lid almost membranous, smooth, only about $\frac{1}{6}$ of an inch long. Filaments nearly white; anthers very pale; their gland inconspicuous; their cells ellipsoid, parallel, slit marginally. Style exceedingly thin, considerably extended beyond the calyx-tube. Fruits smooth, shining, of hardly more than $\frac{1}{8}$ inch measurement, not angular."

It was named in honour of Alfred William Howitt, the most distinguished citizen Gippsland, Victoria, has produced, and who possessed a marvellous first hand knowledge of various sciences, usually enumerated under the designation of Natural History, as the result of his travels in Victoria. His "Eucalypts of Gippsland" in *Transactions of the Royal Society of Victoria*, Vol. ii, p. 81 (1890) is an admirable piece of work, and the present writer is proud that he enjoyed the friendship of, and received instruction from Dr. Howitt for many years.

A portrait and necrology from the pen of Professor (now Sir) Baldwin Spencer, will be found in the *Victorian Naturalist* for April, 1908, p. 181.

RANGE.

Known only from northern Queensland.

"At Lake Lucy near Rockingham Bay" *Dallachy* (original description). Rockingham Bay is $18^{\circ} 5'$ south latitude, and $146^{\circ} 3'$ east longitude, just north of Hinchinbrook Island.

Mueller in "Eucalyptographia" adds to the Lake Lucy locality . . . "thence to the falls of the Herbert River, and also at Glendhu, but nowhere gregarious," on the authority of Police Inspector B. R. Stafford.

In spite of the reference to Rockingham Bay, it does not appear that *E. Howittiana* is found near the coast, for Lake Lucy is a little inland, to the west, being in $18^{\circ} 34'$ south latitude, and $145^{\circ} 17'$ east longitude. Glendhu is a township on the Upper Burdekin, and close by.

The Herbert River Falls are well known, and are on the Middle Herbert, north of Lake Lucy, in $18^{\circ} 33'$ south latitude, and $146^{\circ} 20'$ east longitude.

It will thus be seen that the known habitats of this species are very circumscribed, and further investigation should be made in regard to it, together with particulars as to colour of timber, and we want a more ample description of the bark. These would help in indicating the natural affinities of *E. Howittiana*.

Mr. R. H. Cambage describes a planted specimen in the Rockhampton Botanic Garden as "A pendulous gum-tree, like some forms of *E. tereticornis*. Rough bark on trunk."

AFFINITIES.

"Among the few other species with minute flowers (namely *E. brachyandra*, *E. crebra*, *E. haemastoma* var. *micrantha*, *E. microtheca*, *E. populifolia*, *E. Raveretiana* and *E. stellulata*, this new one is well marked already in its foliage." (Original description.)

These will be taken in order.

1. With *E. brachyandra* F.v.M.

See Vol. iii, p. 219, Plate 127. The anthers are different and in fruits *E. brachyandra* belongs to that Angophoroid group which includes *E. clavigera* A. Cunn. and *E. Spenceriana* Maiden.

2. With *E. crebra* F.v.M.

See Vol. ii, p. 63, Plate 53. *E. crebra* is a Red Ironbark, with narrow juvenile leaves, fruits pedicellate and inclined to pear-shape. The anthers are quite different.

3. With *E. microtheca* F.v.M.

See Vol. ii, p. 51, and Plate 52. Though with larger fruits, they are of the *E. Raveretiana* type, and therefore different from *E. Howittiana*. The buds are pedicellate and of a different shape, the anthers are different.

4. With *E. populifolia* Hook.

See Vol. i, p. 339, and Plate 48. As a rule, the foliage of *E. populifolia* is broader than that of *E. Howittiana* and even nearly circular, and always shining. The venation of the narrow-leaved forms is different to that of *E. Howittiana*. The two species belong to different anthereal groups, the fruits of *E. populifolia* are pedicellate and the rims different.

5. With *E. Raveretiana* F.v.M.

"*E. Howittiana* comes in some respects near *E. Raveretiana*, sharing in the remarkable smallness and also much in the form of the flowers; but it differs significantly in more rigid and often broader leaves with darker and shining upper page, and with hardly perceptible oil-glands; furthermore, flower-stalklets are not developed, or only to a trifling extent, the calyx-tube is not so short, nor are the fruit-valves extruded. With no other species is it closely connected." (Eucalyptographia.) This is Mueller's judgment on such evidence as was available.

See Vol. ii, Plate 53 of the present work. I have not seen juvenile foliage of *E. Howittiana*; it will probably prove to be broadish. The buds are much larger in *E. Howittiana*, and the anthers sharply separate the two species. The fruits of the two species are very different.

6. With *E. stellulata* Sieb.

. . . "the shape of the calyx reminds of that of *E. stellulata*" ("Eucalyptographia" under *E. Howittiana*).

See Vol. i, p. 127, Plate 25 of this work. The inflorescence in *E. stellulata* is axillary, with sessile umbels; in *E. Howittiana* the inflorescence is in panicles with peduncles and no pedicels. The two species both lack pedicels, giving their buds a stellate aspect, particularly in *E. stellulata*. There seems to be no other similarity. The anthers of *E. stellulata* are kidney-shaped, and the venation of the leaves straight.

7. With *E. Cloeziana* F.v.M.

(Foliage)—"which is not unlike that of *E. Cloeziana*, but the flowers of the last are umbellate, therefore not strictly capitate in the panicles, the calyces are remarkably open, not indicating a subsequent fruit much closed like that of *E. Howittiana*, while the young valves are inserted much below the orifice; ripe fruits of *E. Cloeziana* remain still unknown." (Original description.)

"The foliage resembles that of *E. Cloeziana*, but is much wanting in oil-dots; the lid is, however, very different, and the fruits are much contracted towards the summit." (Eucalyptographia.)

Vol. ii, Plates 63 and 64 of the present work may be turned to.

The two species belong to the same anthereal group, but the buds of *E. Howittiana* have no pedicels. The fruits of *E. Cloeziana* are larger, and the valves are usually more exsert, but the shape of the fruit is not very dissimilar to that of *E. Howittiana*. It is nearest to *E. Howittiana* of any species compared with it so far.

Explanation of Plates (132-135).

PLATE 132.

E. Seena Maiden.

- 1*a*. Juvenile leaves; 1*b*, 1*c*, mature leaves, of varying width; 1*d*, buds; 1*e*, fruits, Grafton to Dalmorton, N.S.W. (J.H.M. and J. L. Boorman). *The type*.
 2*a*. Leaf with buds; 2*b* front and back views of anthers. Nymbeida, Clarence River, N.S.W. (District Forester Wilshire.)
 [At p. 26, Part XXXI, I have already stated that I have arrived at the conclusion that Figs. 1*a*—*d*, Plate 130 are an extreme form of *E. Seena* and not of *E. Bancrofti*.]

E. exserta F.v.M.

- 3*a*. Juvenile leaves; 3*b*, immature fruits. Duaringa, west of Rockhampton, Queensland (A. Murphy, jr.).
 4*a*, 4*b*. Mature leaves; 4*c*, buds; 4*d*, front and back views of anthers. Same locality. (A. Beck).
 5. Buds. Rockhampton. (R. Simmons.)
 6. Narrow, mature leaf. Eidsvold, Queensland. (Dr. T. L. Bancroft).
 7*a*. Mature fruits with very wide rim; 7*b*, small fruits. Duaringa, via Rockhampton. (J.H.M.)

E. Parramattensis C. Hall.

(See also Plate 133.)

8. Juvenile leaves, not in the earliest stage. Bankstown to Cabramatta, N.S.W. (J. L. Boorman.)
 9*a*. Buds; 9*b*, front and back view of anthers. "Port Jackson to Blue Mountains." (Rev. Dr. Woolls.)
 10. Shallow mature fruits. Near Public School, Fairfield. (C. Hall.)
 (All the above localities are in the Parramatta district.)

PLATE 133.

E. Parramattensis C. Hall.

(See also Plate 132.)

- 1*a*, 1*b*. Mature leaves; 1*c*, buds; 1*d*, fruits. Near Public School, Fairfield. (C. Hall.) *The type*.

E. Blakelyi n.sp.

(See also Plate 134.)

- 2*a*. Juvenile leaf; 2*b*, mature leaf with fruits; 2*c*, buds. 10-15 miles from Coonabarabran, towards Rocky Glen, N.S.W. (Dr. H. I. Jensen.) *The type*.
 3. Old broad mature leaf. (E. H. F. Swain.)
 4. Broadish mature leaf and buds. Bumbery, near Molong, N.S.W. (J. L. Boorman).
 5*a*. Juvenile leaf, small and thick; 5*b*, narrow, mature leaf; 5*c*, fruits, small, but with well exerted valves. Sunny Corner, N.S.W. (J. L. Boorman.)
 6*a*. Broad mature leaf, with buds; 6*b*, fruits. Tambaroora, N.S.W. (R. H. Cambage.)

PLATE 134.

E. Blakelyi n.sp.

(See also Plate 133.)

1. Leaf in the juvenile stage, but with buds. Hill End, N.S.W. (J. L. Boorman.)
 2*a*. Narrow mature leaf, with buds; 2*b*, front and back views of anthers. Gulgong, N.S.W. (J. L. Boorman.)

PLATE 134—*continued*.*E. dealbata* A. Cunn.

(See also Plate 135.)

- 3a. Twig showing broad mature leaves (of the juvenile form), still in the opposite stage, in bud and flower; 3b, two views of the ripe fruit. "Distant interior, west from Wellington Valley, N.S.W." (Allan Cunningham, 1825, and labelled in his handwriting. Copied from a specimen in the Vienna Herbarium, examined by Schauer. *The type*.)
- 4a. Mature leaf; 4b, bud and immature fruit; 4c, front and back view of anther; 4d, mature and immature fruit. From a co-type collected by Allan Cunningham in the Wellington Valley. (Kew Herbarium.)
- 5a. Juvenile leaf; 5b, intermediate leaf; 5c, mature leaf; 5d, buds; 5e, fruits. Top of Nandi Hill, near Coonabarabran, N.S.W. (W. Forsyth.) *Close to the type*.
- 6a. Juvenile leaf; 6b, small fruits, with exerted valves. Howell, near Inverell, N.S.W. (J.H.M. and J. L. Boorman.)
- 7a. Mature leaf; 7b, buds with opercula longer than those of the type; 7c, fruits, Howell (E. C. Andrews.)
8. Fruits with pedicels longer than those of the type, and twelve in the head. Carabost, Tunberumba, N.S.W. (R. H. Cambage, No. 1015.)

PLATE 135.

E. dealbata A. Cunn.

(See also Plate 134.)

- 1a. Mature leaf; 1b, buds, with almost hemispherical opercula; 1c, fruits with valves well exert. Bullock Creek, 20 miles north-west of Trundle, N.S.W. (R. H. Cambage, No. 1013.)
2. Mature leaf and buds. The buds broad, with short opercula, and angled calyx-tube. Condobolin, N.S.W. (J. L. Boorman.)
- 3a. Mature leaf; 3b, large buds. Barrigan Ranges, Bylong, N.S.W. (R. T. Baker.)
4. Juvenile leaf. On the plains near Baradine, N.S.W. (W. Forsyth.)

E. Morrisii R. T. Baker.

5. Juvenile leaves. Girilambone Hill, N.S.W. (J.H.M. and J. L. Boorman.)
- 6a. Mature leaf with fruit; 6b, buds; 6c, mature leaf with fruits; 6d, 6e, front and back views of anthers; 6f, side views of fruits; 6g, end views of fruits. Taken from Mr. Baker's drawing of the type in Plate xviii, *Proc. Linn. Soc. N.S.W.* xxv, 312 (1900).
- 7a. Large mature leaf; 7b, buds, small sessile and with nearly hemispherical operculum; 7c, immature fruits. (Drawn from the type specimen collected by Mr. W. Baeuerlen at Girilambone.)

E. Howittiana F.v.M.

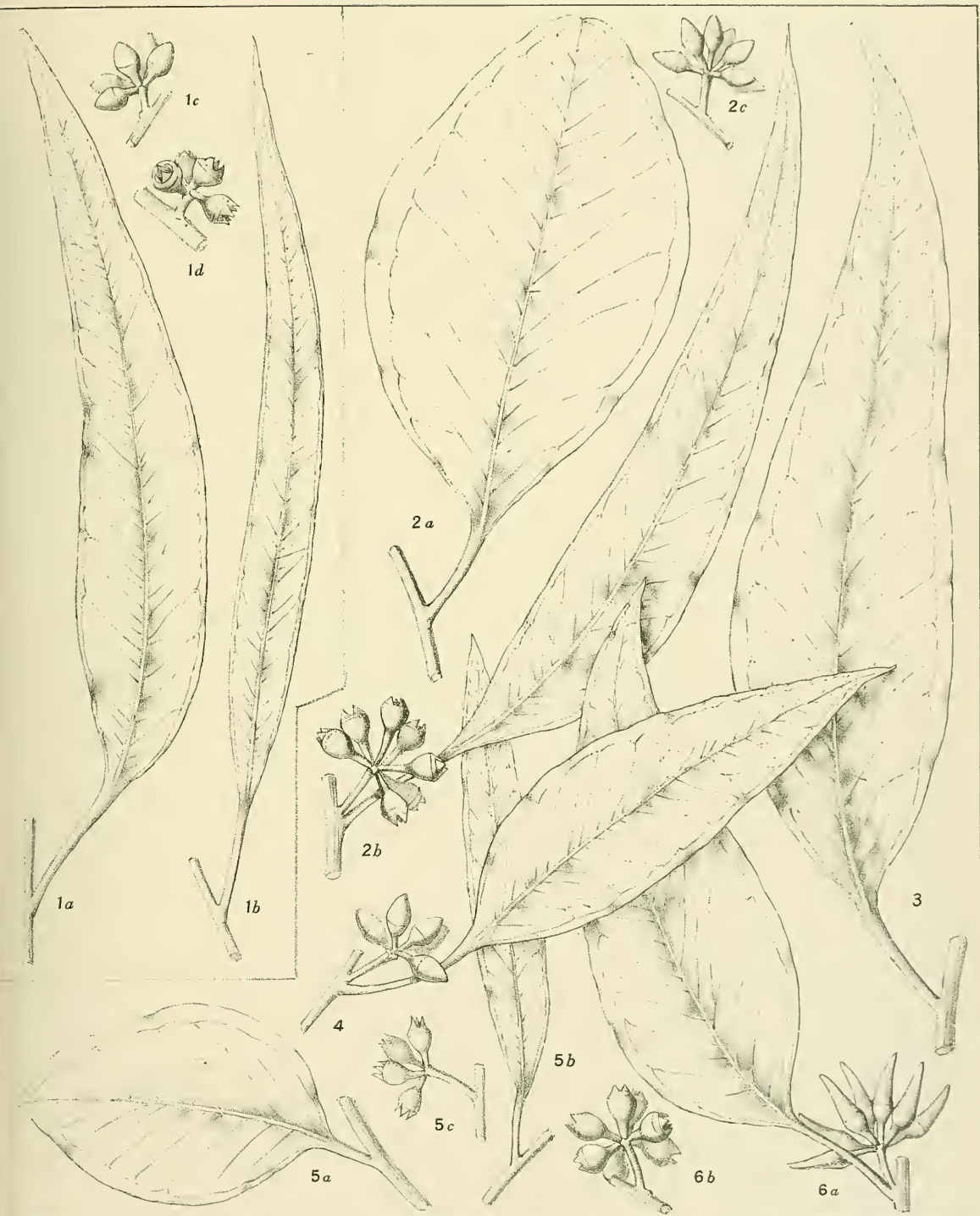
- 8a. Juvenile leaf, not quite in the earliest stage; 8b, front views of two anthers; 8c, back view of an anther; 8d, mature leaves, with buds, flowers, and also immature fruits; 8e, fruits. Rockingham Bay, Queensland. (R. B. Stafford.) *Co-type*.



M. Floeckton del. et lith.

EUCALYPTUS SEEANA MAIDEN. (1-2) E. EXSERTA F.v.M. (3-7)

E. PARRAMATTENSIS C. HALL. (8-10) [See also Plate 133.]



M. Flockton del. et lith.

EUCALYPTUS PARRAMATTENSIS C. HALL. (1). [See also Plate 132.]

E. BLAKELYI MAIDEN. n.sp. (2-6). [See also Plate 134.]



M. Flochon. del. et lith.

EUCALYPTUS BLAKELYI MAIDEN. n.sp. (1-2). [See also Plate 133.]

E. DEALBATA A. CUNN. (3-8). [See also Plate 135.]



M. Flockton del. et lith.

EUCALYPTUS DEALBATA A. CUNN. (1-4). [See also Plate 134.]

E. MORRISII R. T. BAKER. (5-7) E. HOWITTIANA F.v.M. (8)

DESCRIPTION.

CLXVIII. *E. rostrata* Schlechtendal.

IN *Linnaea* xx, 655 (1847).

FOLLOWING is a translation of the not easily accessible, and not entirely satisfactory, original description :—

Branches slender, and, like the remainder of the parts, glabrous, the ends angular, the remainder terete; bark pale-coloured. The few-flowered, pedunculate umbels (umbelliform cymes they should rather be called) are borne in the branchlets of the first year's growth in the lowest axils of the leaves; by non-development of the apex or terminal bud of the flower-bearing branch, the flowering of the terminal or axillary inflorescence characterises the species, and forms a compound panicle out of alternate umbels as we have somewhat frequently seen. Leaves coriaceous, with a paler mid-rib, the lateral veins of which join it to a thin vein running close to the somewhat thick margin, so that the obsolete glands on each side of the leaf, which is the same colour on both sides and glaucous, can only be observed by the aid of a lens. Petiole 4-6 lines long; the blade (4-5 inches long, including the petiole, and 5-8 lines broad) in the lower part a little broader, tapering into the base, and gradually narrowed into a very acute point at the apex, inequilateral and slightly falcate. Umbels axillary, 2-5 flowered, the common peduncle 2 or 3 times longer than the pedicels, which are about 3 lines long. Bud as long as the pedicel, the calyx-tube semi-globular, operculum depressed-semi-globular, subulate-rostrate, rostrum $1\frac{1}{2}$ lines long. Stamens longer than the calyx-tube, pistil angular, the apex obtuse bearing the stigma, shorter than the stamens. (The Latin ends here).

On the banks of brooks and rivers (White Gum of the colonists). A large tree with white bark (German in original).

It was then described by Bentham in B. Fl. iii, 240, and also by Mueller in "Eucalyptographia," with a plate.

Under "Range" I have some notes on exceptional barks in this species.

This is a smooth-barked species, and it is usually somewhat scrambling and spreading in its habit, which gives it considerable picturesqueness. Like many other Gums, it has more or less flaky bark on the trunk, which, being deciduous, gives the smooth bark a more or less blotched appearance. The butt is rarely clean to the ground, but has more or less flaky, friable bark, usually of no great thickness.

"In one specimen from the granite hills between Nine-Mile Creek and Broken River, Victoria, F. Mueller has appended the note that the bark is persistent like that of 'Box.'" (B. Fl. iii, 240).

The juvenile foliage is of medium width; at the same time it is often broad (*e.g.*, Moree), but it is always thin and glaucous, thus contrasting with that of *E. tereticornis*.

"The leaves verge exceptionally into an oblong- or oval-lanceolar form; they are neither very shining, nor of very dark green, indeed not rarely of a dull and pale hue, particularly in arid regions of the interior." (Mueller.)

The species varies much in width and length of leaves. Some are almost linear lanceolate, others bulky broad lanceolate. Plates 136 and 137 will at once give some idea as to the variation.

3. Var. *borealis* Baker and Smith, "Research on the Eucalypts," p. 75.

The authors say that no differences could be detected between this form and normal *rostrata*, "but they differ, however, in chemical constituents." This, of course, raises a question that I have often discussed, and if it should prove that the difference in oil constituents cannot be explained other than by the ordinary variation we expect to see in plants under different environments, the taxonomist must be excused if he places two forms together which have no morphological differences. See fig. 3, Plate 137.

RANGE.

It was originally described from South Australia. Bentham expands the South Australian localities to :—Banks of streams, "White Gum," *Behr.*; from the Murray to St. Vincent's Gulf, "Red Gum," *F. Mueller* and others; Three Well River (Kangaroo Island, J.H.M.) *Waterhouse*; W. of Lake Torrens, *Babbage*; in Herb. R. Br. In Victoria he gives from the Yarra to the Murray, *F. Mueller*, and under New South Wales, Lachlan and Darling Rivers to the Barrier Range and Cooper's Creek, *Victorian and other Expeditions*. (This really takes us to western Queensland and perhaps South Australia. J.H.M.); New England, *C. Stuart*. (It exceptionally occurs on New England proper, which is too cold for its proper development. J.H.M.).

Mueller's general statement of Australian distribution is as follows :—

"Along river-banks or in alluvial valleys throughout nearly the whole Australian continent, but absent from some of the coast country, from the extreme of South West Australia and altogether from Tasmania, nowhere ascending high mountain altitudes, nor occurring away from moist oases in any desert regions, reaching the coast borders in Victoria, South Australia, and at least occasionally in South Queensland, traced by me to littoral tracts on the lower Victoria River in Arnhem's Land, and in West Australia, south to the Murchison River." ("Eucalyptographia.")

E. rostrata is the tree which is most commonly known as "Red Gum" in Australia, although other species (particularly *E. tereticornis*) also pass under that designation in certain areas. It also often goes under the name of "Flooded Gum." It is one of the most widely diffused species, being found in every State of the Commonwealth, Tasmania alone excepted. It prefers good soil and a moist bottom, hence it frequents the banks of rivers and it is to be found in depressions and along dry water-courses. It often grows in country which is submerged for a portion of the year, and hence unsuited for agricultural purposes. The principal area of this kind is known as the Murray Red Gum Forest Area, which yields a large annual revenue to the New South Wales Government for royalties, and which forms one of our permanent natural forests.

WESTERN AUSTRALIA.

"Generally lining the watercourses of the far interior, observed by me in the littoral portion of West Australia, southward only to the Murchison River, but occurring also in the oases, where humidity lodges, towards Shark's Bay, then often along the streams of also the tropical portion of West Australia." (Mueller, "Forest Resources of Western Australia," p. 9.)

"The sub-tropical examples are small trees of somewhat irregular growth, with a persistent rough grey bark at the base of the trunk, and smooth and white upwards. 'Flooded Gum.' The tropical specimens consist of straight growing trees to 80 feet; trunk to 40 feet or more; diameter to 2 feet; bark smooth and white; timber red, tough, and fairly hard. 'Red Gum.' 'White Gum' of Kimberley." (W. V. Fitzgerald).

Following are some specimens in the National Herbarium, Sydney :—

Ovoid buds, Nannine (W. V. Fitzgerald). "Pendent leaves, tree of 25 feet, whitish bark." Bowes River (Dr. L. Diels, No. 2,081). Ovoid buds, Baltra, Ashburton River (Dr. Alex. Morrison).

We are now in the tropics :—

"Tree of 5-10 metres, pendulous leaves, bark softly white, leaves very white." Roeburne Creek, in muddy clayey soil, amongst shrubby Acacias (Dr. L. Diels, No. 2,759). "Flooded Gum." Banks of dry creeks. Strelly River, &c. (Dr. J. B. Cleland).

Near Mt. Eliza (W. V. Fitzgerald, No. 737). Isdell River, alongside Isdell Range (W. V. Fitzgerald, No. 1,479). May River (W. V. Fitzgerald). Barker River (W. V. Fitzgerald, No. 1,533). White Gum, the trunks perfectly white. Noonkambah (E. Mjöberg). The last five specimens all from West Kimberley.

SOUTH AUSTRALIA.

The type came from this State. Following are some specimens :—

Thistle Island, Spencer Gulf, Robert Brown collected hereabouts in 1802 (J.H.M.). Port Lincoln to Coffin's Bay (J.H.M.). Onkaparinga (Mueller). Mt. Barker (J.H.M.). Mitcham (Max Koch). "Red or River Gum. Aboriginal names, 'Kalpuru,' 'Apera,' and the seed, 'Powa.'" "Buds nearly ovoid." Mt. Lyndhurst (Max Koch). Ediwie (Max Koch, No. 27). Moolooloo Station, between Beltana and Blinman (Mrs. R. S. Rogers). Macumba Station, beyond Oodnadatta (J. M. Black). Buds tending to be ovoid. Mt. Daer (*sic*) Station, Dalhousie Springs (Thomas Gill).

NORTHERN TERRITORY.

Buds nearly ovoid. Finke River (Rev. J. Kempe). Buds tending to ovoid. Powell's Creek Telegraph Station, about 18° S. Lat. (N. Holtze). White stem, brownish yellow marks, along watercourses. Jay Creek, 21st March, 1911. (G. F. Hill, No. 115).

VICTORIA.

It is spread over the greater part of this State, except that it is rare in Gippsland, and is not found on the higher ranges and on certain coast tracts (Howitt).

Following are some specimens :—

Kew, Melbourne (J.H.M.). Upper Yarra (J. Staer). Buds conical. Slight tendency to var. *acuminata*. From a silurian hill close to the Yarra (A. D. Hardy). Barwon River (E. E. Pescott).

"Fringes all the sides of rivers ; open land. Timber red, bark deciduous to the root. Tree 30-40 feet high." Wando Vale (J. G. Robertson, 17th December, 1843).

Mr. J. Blackburne sent me specimens of buds greatly enlarged with galls produced by a dipteran belonging to the Family Agromyzidae. His specimens came from Maryborough and St. Arnaud. He adds "This affection seems universal all over Victoria this year." (1909). I have already noted them in *E. tereticornis*, *E. dealbata*, and *E. Blakelyi*.

Heathcote (W. S. Brownscombe). Dunkeld (H. B. Williamson). Stawell (J. Staer). Dimboola (St. Eloy D'Alton). Wangaratta (correspondent of Mueller).

Sale, Gippsland (Junction of Thompson and Latrobe Rivers) (H. Hopkins, 6B, 6D). Fruits largish, hemispherical, and with a sharp rim. Also small, nearly sessile fruits. With a little care, Mr. Hopkins was able to point out several details of variation in the Sale district.

NEW SOUTH WALES.

Following are a few notes in regard to the occurrence of the species. It is very common over the western and south-western portions of the State, where the rainfall is light. I have not repeated the name "Red Gum," under which it is usually sent.

The Murray River (chiefly right bank) generally. Gulpha Island, near Mathoura (R. D. Hay). Barham (Assistant Forester Chanter). Moama (Forest Guard Watson).

"No. 1. Edible Red Gum." "No. 2. Non-edible Red Gum." Sheep are reputed to eat the former and not the latter, but I can see no differences between them. I will again refer to this in my "Forest Flora of New South Wales."

Bongbilla, Moulamein (T. Grieve).

In Box-forest, co. Denison, also co. Hume, with longish opercula showing some affinity to *E. dealbata* A. Cunn. (Forest Ranger S. Payten).

Hovell's tree at Albury, showing the spot where Hume's party sighted the Murray River. It is the identical gum-tree on which Captain Hovell, leader of the party, cut his name on 17th November, 1824. The monument erected to the memory of the party is close by. (Photo presented by Mr. J. E. R. Fellowes). The buds are conical, and show some transit between the normal form and var. *acuminata*.

"Smooth whitish bark, tree of 50-100 feet. Trunk rougher than usual in *rostrata*, bark falling in strips on upper limbs," buds conoid, glaucous. Some affinity to *E. dealbata*. Albury (Rev. J. W. Dwyer, No. 109).

"River Gum." Wollongawah, Tumut (W. S. W. de Beuzeville). Tall massive trees of 50 feet growing along the banks of the Gilmore Creek, and on the flats, right up towards Batlow and Tumut (J. L. Boorman).

Carabost, Tumberumba. A form with exceptionally long pedicels, perhaps showing affinity to *E. dealbata*. Seen only in fruit. (R. H. Cambage, No. 1,015). Burrinjuck (J. L. Boorman.)

With bark like an Ironbark to the branches. On Bowning Creek, a mile from the township (A. Murphy).

Zara, Wanganella, via Hay (E. Officer). Near Lake Urana (J. G. Luehmann, jr.). Lining creek at Wagga Wagga (Dr. H. I. Jensen). Banks of Murrumbidgee at Gundagai (W. D. Francis).

"Flooded Gum," Wyalong (District Forester Osborne). Grenfell (Forest Guard H. F. Webber). 12 miles out from Temora on road to Grenfell (Rev. J. W. Dwyer, No. 142). Bimbi, via Young and Grenfell (J.H.M.). Weddin (J.H.M.).

Large hemispherical *E. rudis*-like fruits; also fruits smaller than the normal, and buds with opercula more attenuate than the normal. Dirt Hole Creek, Rye Park, near Burrowa (V. Roberts).

Eighty-one years ago, on the occasion of the exploration of western New South Wales it was referred to in these words :—

"The Yarra grew here (Lachlan River) as on the Darling, to a gigantic size, the height sometimes exceeding 100 feet. The Yarra is certainly a pleasing object, in various respects; its shining bark and lofty height inform the traveller of water, or at least of the bed of a river or lake; and being visible over all other trees, it usually marks the course of rivers so well, that in travelling along the Darling and Lachlan, I could with ease trace the general course of the river, without approaching its banks, until I wished to encamp." (Mitchell's "Three Expeditions," ii, 54). He also gives a picturesque description of the tree.

Lachlan River (J. Duff); Lower Lachlan River, with fruits larger than the normal (H. Deane). "Forest Gum," "Gungwung" of the aborigines. Lachlan River (Forest Ranger R. Kidston). Lake Cudgellico (J. L. Boorman). Wooyeo, Lake Cudgellico (G. Stirling Home). Euabalong (J. L. Boorman). Bullock Creek, 25 miles north-west of Trundle (R. H. Cambage, No. 1,014). Referred to under var. *acuminata* at p. 67. Bogan Gate (J. L. Boorman). Manildra (J. L. Boorman). With glaucous fruits, showing some affinity to *E. dealbata*. Borenore, near Orange (H. Deane). Dubbo (C. J. McMaster, J. L. Boorman).

"Six miles on the Dubbo side of Gilgandra. Large tree like *E. tereticornis*. Growing alongside creek." Shortish lanceolate leaves. Neither buds nor fruits quite normal for either *E. rostrata* or *E. dealbata*. A most puzzling form, perhaps nearer to *E. rostrata* (W. Forsyth).

Narromine (J. L. Boorman). Mt. Harris, near Warren (J. L. Boorman). Nyngan (W. Baeuerlen). Type of var. *borealis* (Baker). Referred to at p. 68.

Banks of the Bogan near Nyngan (J.H.M.). Fruits mostly larger than those of var. *borealis* (type). I carefully selected my specimens, and the width of the juvenile leaves varied from linear to lanceolate. The usual rostrate buds in both these specimens. At the same time, Messrs. Baker and Smith have already stated that there is no morphological difference from *E. rostrata*.

"No. 2. River Red Gum." Nyngan (District Forester C. Marriott). Fruits of normal size and buds conical. (A dormant tendency in this species to var. *acuminata*.)

Bogan River at Coolabah (J. W. Peacock, J. L. Boorman).

Ovoid buds. Sandy Creek, 14 miles north of Gilgunnia (R. H. Cambage, No. 1,012). See *Proc. Linn. Soc. N.S.W.* xxvi, 206 (1901). 30 miles north-east of Mt. Hope (R. H. Cambage).

The following specimens are all west of Bourke, and therefore in as dry country as there is in New South Wales. While not as rostrate-budded as the type, the buds are pointed ovoid in shape, and are not distant from the type. The foliage is rigid, dry, thickish, and with marked venation, as is not to be surprised in such dry country.

Broken Hill. Normal (Assistant Forester H. W. Garling, No. 23). Euriowie, via Broken Hill (J. E. Carne, per R. H. Cambage). "Glaucous. Stem like *E. rostrata*, but colour of adult trees rather blue." Wilcannia Road, 30 miles west of Broken Hill (Dr. J. B. Cleland). Gum Creek, Poolamacca, Barrier Ranges (C. J. McMaster). Evelyn Creek, north of Barrier Range. Normal (A. King). Tree of 20-40 feet, diameter 1-2 feet. Grey Range, near Tibooburra. Normal (W. Baeuerlen).

Now we return from the interior, and come to a mountainous region very much nearer the coast.

"A small tree of 20-30 feet, with smooth, gum-like bark. Wood soft. Leaves long, thin, pendulous, as also its branches, a rare tree in the district." Hargraves and South Hargraves (A. Murphy and J. L. Boorman). In fruit only. Fruits glaucous and not perfectly ripe. A form intermediate between *E. rostrata* and *E. dealbata*. Grattai (Mudgee to Wellington) (A. Murphy).

"From the garden of Mr. Scott. Glendon" (near Singleton) (Dr. L. Leichhardt).

"Blue Gum." White to bluish bark on limbs, rough box-bark on base, Namoi River (Dr. H. I. Jensen). Narrabri (H. Deane, Forest Ranger McGee, J.H.M.). Narrabri West (J. L. Boorman).

On the sides of watercourses, plains near Baradine (W. Forsyth).

White limbs, slaty butt, crooked tree of 15 feet, Gil Gil Creek, Benarba (E. H. F. Swain, No. 5B).

At no other place in the district is this gum found, save on the banks of the Gwydir River. Moree. The juvenile leaves broad. (J. L. Boorman). Moree (R. H. Cambage, No. 955). Warialda. Quite normal (J.H.M. and J. L. Boorman).

"This appears to me to be *E. rostrata*; if so, is it not in a peculiar locality, in the heart of Mt. Mitchell scrub (Warialda district), miles from a watercourse?" (W. A. W. de Beuzeville). My reply was that there is probably underground water.

Warialda, in fruit, not quite normal. Very short pedicels. Approaching *E. dealbata* (W. A. W. de Beuzeville, No. 9).

On Gwydir at Bingara (J.H.M.). "Head of the Gwydir" (Dr. Leichhardt). Between the Gwydir and the McIntyre Rivers. Yagobie (E. H. F. Swain, Nos. 3 and 17). "On the bed of the Big (McIntyre) River," 24th March, 1843 (Dr. L. Leichhardt).

E. rostrata is said to occur on the Tenterfield Creek (H. Deane). I have not seen specimens.

Banks of the Severn River (C. Stuart). [These are the only two New England localities I know, and the range in New England is worthy of inquiry.]

QUEENSLAND.

E. rostrata is extensively distributed in Queensland in situations approximately identical with those under which it occurs in New South Wales.

Following are some Queensland localities going roughly south to north. :—

Texas (J. L. Boorman). “River Gum,” Buds tending to ovoid. Cunnamulla (F. H. Perkins). Bulloo River (J. F. Bailey). Buds tending to ovoid, others nearly normal. Charleville (E. B. Atkins). Rockhampton (T. J. Byerley, R. Simmons). Buds tending to ovoid. Gadwall, Alpha (G. T. Wood).

Bogantungan, 220 miles west of Rockhampton, at 1,100 feet. Buds a little conical (R. H. Cambage, No. 3,972).

Mirtna Station, *via* Charters Towers (Miss Zara Clark).

In granite creek at 1,550 feet. Common along many creeks here. Alma-den, between Cairns and Croydon, North Queensland (R. H. Cambage, No. 3,875).

“Blue Gum.” Chillagoe (E. Doran). Croydon (James Gill).

Noticed near Forsayth, but was not seen afterwards on either the Etheridge River, the Gilbert, or the lower Flinders (R. H. Cambage). Mitchell River (E. Palmer).

It is a common tree on the banks of many of the rivers and large creeks of North Queensland. It is often associated with *Casuarina Cunninghamiana* (River Oak), and while usually not able to ascend so far, can descend much further down the streams, and this attribute or quality has enabled it to cross the continent from north to south and from east to west (R. H. Cambage).

AFFINITIES.

1. With *E. tereticornis* Sm.

“ . . . is, as observed by F. Mueller, very closely allied to *E. tereticornis* . . . From *E. tereticornis* it is chiefly distinguished by the operculum. It has also usually smaller flowers and fruits.” (B. Fl. iii, 240).

“ . . . Still instances occur when it merges completely into *E. tereticornis*; indeed from a strictly phytographic view it should be considered merely a variety of that species, but for convenience sake and practical purposes the specific name may well be retained for so important a tree as this.

“ . . . while *E. tereticornis* replaces it in many coast-tracts of Queensland, New South Wales and Gippsland. The only differences of *E. tereticornis* consist of the generally more elongated and often blunter lid of the calyx, very gradually tapering upwards, constituting a narrow cone, and in the perhaps rather more protruding summit of the fruit; the filaments are also often straight while in bud, as in *E. cornuta* and its allies, through not being forced to inflexion within the long cavity of the lid.” (Eucalyptographia, under *E. rostrata*).

Plate 128, Part XXXI, may be compared with Plates 136, 137. The texture of the leaves is not brought out in the drawings, but, speaking generally, those of *E. tereticornis* are the coarser, and often larger, though the latter character must be considered with care. As a rule, though not an invariable one, the marginal vein is closer to the edge in *E. rostrata*. The opercula of *E. tereticornis* are more cylindrical, though, e.g., figure 5b of Plate 128, they may be as short and as rounded as those often found in *E. rostrata* in far interior districts. The fruit of *E. tereticornis* is coarser than that of *E. rostrata*, and the rim never so sharp.

2. With *E. exserta* F.v.M. The affinities of these two species are dealt with at p. 36, Part XXXII.

3. With *E. rudis* Endl. The affinities of these two species are dealt with at p. 78.

4. With *E. viminalis* Labill.

" is, as observed by F. Mueller, very closely allied to *E. viminalis* From the former (*viminalis*) it differs in the longer pedicels, in the operculum, and in the shape of the fruit, the rim and capsule always much more exserted." (B. Fl. iii, 240).

" still instances occur, when it merges almost into *E. viminalis* The main distinctions of *E. viminalis* consist in its having typically only three flowers to each stalk, in the generally shorter stalklets, in the lid being never contracted into a long beak-like acumen, and in the valves not being so much elevated above the margin of the fruit-calyx by the intervening rim." ("Eucalyptographia" under *E. rostrata*).

E. rostrata has a red timber, *E. viminalis* a pale one. The narrow juvenile leaves of *E. viminalis* at once separate the species from those of *E. rostrata*.

DESCRIPTION.

CLXIX. *E. rudis* Endlicher.

IN Baron von Huegel's *Enumeratio Plant. Novæ Hollandiæ, ora Austro-occidentali*,
p. 49 (1837).

THIS may be translated as follows :—

Leaves alternate, ovate-lanceolate, acuminate, with an intra-marginal vein, the petiole of the axillary umbel shorter than the terete peduncle, the conical operculum of the same length as the calyx-tube.

Type from King George's Sound (Huegel).

Nearly related to *E. incrassata* Labill. *Nov. Holl.* t. 150, differing in its more slender branches, ovate-lanceolate leaves, long acuminate, 6-7 inches long, an inch and a half broad at the base, veins less prominent, arranged in acute angles, petioles an inch longer than the umbels, peduncle terete, flowers somewhat small, the calyx-tube and operculum wrinkled.

Then it is described by Schauer in *Plantae Preissianæ* i, 130 (1844) under Preiss's No. 252 (in Vienna Herbarium) from the Swan River, as a tree of 45 feet, with graceful loose branches.

Mueller ("Eucalyptographia") says :—"Commissural line between the lid and the tube of the calyx rather prominent, by which characteristic this Eucalyptus can readily be distinguished from allied species."

A commissure is defined as a joint seam or closure, the place where two bodies (operculum and calyx-tube in this case) meet and unite. Mueller's statement must not be misunderstood, as this commissure, which is an indication of the early falling off of a second operculum, is much more common in Eucalyptus than was at one time supposed. *E. punctata* DC. is a common east Australian example.

Rudis (Latin) means rough and crude ; it may be that in this word we have a reference to the comparative worthlessness of the timber. There are, however, very few references to the timber published. "Timber seemingly of little value except for fuel" (Mueller). It is a brown to pale brown timber, and while travelling in Western Australia I used to be usually informed that it is "no good." The remarks under "Range" that at York one of its names is "Wormwood," because of its liability to insect attacks, supports this judgment. The subject is still further referred to when contrasting this species with *E. rostrata*. It is usually known as "Swamp Gum" or "Flooded Gum," from the situations in which it usually grows. It is less commonly known as "Blue Gum."

It may be that it is the "Blue Gum" or "Colort" (native name), "on river banks and flooded lands, a sure indication of vicinity of water." See Captain Lort Stokes' *Discoveries in Australia*, ii, 132.

Mueller speaks of it as one of the few Western Australian species whose leaves yield oil in quantity.

It is a species of *Eucalyptus* (*E. robusta* Sm. and *E. rostrata* Schlecht are others) which throws out adventitious roots, usually from the injured bark or a wounded limb. An excellent account (with three photographic illustrations) of these aerial or adventitious roots from the pen of Mr. W. Catton Grasby, will be found in the *Western Mail*, (Perth), of 5th June, 1914.

The bark of this species is corky and thin flaky, that is to say, the rough bark, which is not flattish and not thick, is so much fissured, both longitudinally and transversely, that it breaks into small flakes with but slight violence.

RANGE.

This species is confined to Western Australia, and the type came from King George's Sound. (This may mean "King George's Sound district," as I have not yet seen a specimen collected at the Sound itself.)

Bentham gives localities as "Sandy woods, Swan River, *Preiss* No. 252, *Drummond* No. 58; Vasse River, "Flooded Gum," *Oldfield*; Gardner River and grassy flats near Salt River, "Swamp Gum," *Maxwell*.

Mueller (*Forest Resources of W.A.*, p. 10) defines the range as :—"On river banks from Swan River to Cape Leeuwin, and eastward at least as far as the Gardiner (Gardner) River. "There are two Gardner Rivers, one between the Warren River, and Brooke's Inlet. The more eastern one is that indicated by Bentham as near the Salt River. It and the Salt River and the Phillips River (where Mr. Cecil Andrews collected it, and apparently the most south-eastern locality so far) are in the same general district, north-west of Esperance.

It is also found as far north as Northampton, in the Geraldton district, so that we have a fairly extensive range in the south and west coastal districts. It is essentially a lover of damp, undrained localities, and banks of streams, though it has become acclimatised in a number of situations to the sides of hills and comparatively dry situations.

Starting from the south (Cape Leeuwin) and working north, we have specimens from the following localities :—

"Tree of 25 metres, foliage drooping." Balbarrup, Blackwood River (Dr. L. Diels, No. 2,616). Bridgetown, also on the Blackwood (C. H. Ostenfeld, No. 509). Vasse River (near Busselton), in clayey, sandy land (Dr. L. Diels, No. 2,655).

"Blue Gum." Capel (Forest Ranger Donovan). "Flooded or Blue Gum," near Waroona (Woods and Forests Department, January, 1903). Banks of Hotham River at Marradong (Dr. A. Morrison). "Gum like Red Gum" (*i.e.*, *E. rostrata*), Serpentine (Dr. J. B. Cleland, No. 6). We are now in the suburbs of Perth. Armadale (C. H. Ostenfield, No. 505).

"Swan River." (L. Preiss, 1843, No. 252, referred to by Bentham as having been distributed with mixed material.)

Subiaco, Lower Swan (Dr. L. Diels). Herdsman's Lake, near Perth (Cecil Andrews). East Perth (A. G. Hamilton, No. 74). South Perth (J.H.M.). "30-40 feet. Trunk, 12-15 inches. Growing near or in watercourses." Maddington, near Perth (Dr. F. Stoward, No. 134). "Flooded Gum. Height 40-50 feet. Up to 2 feet in diameter." On the bank of the Swan River, near University site at Crawley, near Perth (Dr. F. Stoward, No. 123).

"Flooded or Swamp Gum. Stamens white." Near Perth (W. V. Fitzgerald). We ascend the Darling Range. "Tree of 10 metres, with glaucous pendent foliage near *E. rudis*." With large fruits, some inclining to pear-shape. Bellevue, Swan River (Dr. L. Diels, No. 2,723, as *E. rostrata*, approaching *E. rudis*). I prefer to label it *E. rudis*, and say that it shows some affinity to *E. rostrata*. See fig. 3, Plate 139. Parkerville, near Perth (J. Staer). Gooseberry Hill, Darling Range (Dr. A. Morrison). Somewhat variable, apparently taken from two or three trees.

We continue to go east. "Tree of 25 metres in sub-humid situations amongst Acacias." In fruit only. Clackline, Avon district (Dr. L. Diels, No. 2,573, as *E. rostrata*. "Form approaching *E. rudis*."). I am inclined to label this *E. rudis*, showing some affinity to *E. rostrata*.

"I took specimens at Baylup, a few miles east of Wooroloo, in April, 1906 (No. 1,351). I was in close contact with the species at Swan Mill; trees growing within a few yards from my house." (Max Koch.)

E. rudis. 30-40 feet. Growing on the banks of and in shallow creeks. Wooroloo (Dr. F. Stoward, No. 105).

"Wormwood. The name arises from the fact that when a tree is felled it rapidly becomes riddled with innumerable grub-holes, so as to almost fall to pieces at times." Banks of Avon River at York (O. H. Sargent, No. L1). "Wormwood" is typical *E. rudis*. "Wormwood." Filaments, white. Tree of about 20 feet, in humous sand in dry part of river bed. Avon River at York. (O. H. Sargent, No. 175).

Bank of Avon River, near Central Bridge, York (O. H. Sargent, No. 322). Fruits rather small, and certainly approaching *E. rostrata*. Banks of Avon River at York (O. H. Sargent, No. 175b). Similar to 322. Very small fruits, apparently a starved specimen. "Riversville." York. In sand in bed of Avon (O. H. Sargent, No. 331). Tree of about 30 feet, south bridge over Avon River (O. H. Sargent, L2 and 642E). Typical *E. rudis*. York (J. Staer). Typical *E. rudis*.

Banks of Avon River, Beverley (Dr. F. Stoward, No. 270). This is our furthest east in practically the latitude of Perth. We break away south-east in comparatively dry country (for *E. rudis*), and find it at Phillips River (Cecil Andrews), which is north-west of Esperance, and more east than any other locality known to me.

Now we return to the coast, and it occurs "between the Moore and Murchison Rivers" (E. Pritzel, No. 639). Almost typical *E. rudis*.

Large tree on pasture land. Narrow lanceolate leaves. Buds somewhat small and showing commissure. Between Ebbano and Yandanooka. Victoria district (Dr. A. Morrison).

Then I found it in the bed of the Irwin River, near Dongarra, and as I studied with the view to compare it with *E. rostrata*, my notes will be found at p. 79.

Fruits rather small, and the rim domed rather than sharp, as in the normal form, Northampton (J.H.M.). This is about 30 miles north of Geraldton, and is the most northerly locality recorded so far as I know. Diels and Pritzel refer to "indistinct tropical forms" between Northampton and the Murchison, but I have not seen them.

AFFINITIES.

1. With *E. rostrata* Schlecht.

"It is . . . almost linked by exceptional transit forms with *E. rudis*, which takes its place in littoral South and West Australia. . . ."

"In *E. rudis* the bark is extensively persistent and rough, the leaves are often broader, hardly so regularly and distinctly feather-veined, the flowers are fewer in the umbels and mostly larger, the calyces are often dark-coloured, the lid is almost conical, the half-ripe fruit somewhat bell-shaped on account of its prominent narrow slightly expanding margin, the ovary is then more sunk, the ripe fruit is usually larger, less or not rounded at the summit, but rather semiovate, not very convex, nor very wide at the rim, by which means the exerted portion is more evidently shorter than the tube of the fruit-calyx, or the valves may remain even half enclosed; to these distinctions may be added, that the leaves of young seedlings are roundish and almost sessile, not narrow-lanceolate as in *E. rostrata*." ("Eucalyptographia" under *E. rostrata*).

Diels and Pritzel's remarks (*Engler's Jahrb.*, xxxv. 442. 1904) may be translated as follows :—

When Mueller recorded *Eucalyptus rostrata* from localities in Western Australia going south to the Murchison River, he referred to intermediate forms between that species and *E. rudis*.

"We saw *E. rostrata* (small fruits) with indistinct tropical forms in alluvial muddy localities between Northampton and the River Murchison. Typical *E. rudis* (large fruits) was only observed in abundance in south-west regions (that is, between the Blackwood and Vasse Rivers).

"Almost all (rarely 'exceptionally,' as Mueller thought) the forms of the intermediate localities agree in the structure of the fruit closely to typical *rostrata*, but with *E. rudis* in size.

"We obtained it from the Swan, Avon, Irwin and Greenough districts as 'Flooded Gum.'"

When in Western Australia. I gave the matter some attention, and the following notes were written down by me in front of the trees at Dongarra.

"The Irwin River, for a considerable distance from the bridge, is lined almost exclusively with a scrambling drooping White Gum, which grows in the bed of the river, and on its banks.

"It certainly is the counterpart of *E. rostrata* and very difficult to distinguish from it, except on careful examination. Its leaves (sucker and mature) are different. Its habit is more scrambling and sappy. Timber pale, and reputed to be worthless, while that of *E. rostrata* is red and usually durable."

Its sucker leaves are larger and broader than those of *E. rostrata*, and the foliage generally is richer in oil, and less dry in texture.

Although the buds are small, as small as those of *E. rostrata*, there is what Mueller calls the "commissural line," which is not seen in *E. rostrata*, but the contour of these small buds very strongly resembles those of the ovoid buds, sometimes with a slight tendency to a point, which are very common in *E. rostrata*. Bearing these notes in mind, and with the aid of the figures, there should not be any serious difficulty in dealing with "intermediate" forms.

Mr. Max Koch contrasts the two species as follows :—

(1) "Buds, flowers and fruits, are much larger in *E. rudis* than in *E. rostrata*."

(2) "*E. rudis* never attains any size; the largest tree I noticed was not more than 18 inches in diameter."

(3) "The outer bark is *not* deciduous like in *E. rostrata*."

(4) "The wood of *E. rudis* is of yellowish colour, that of *E. rostrata* is red. The wood of *E. rudis* is brittle and useless except for firewood. The timber of *E. rostrata* is hard and tough, and much in demand for sleepers in S.A., and generally considered very useful for many purposes."

(5) "The bark of *E. rudis* is of a darkish grey, while that of *E. rostrata* is of a light grey colour, and is almost white after the old outer bark peeled off."

(6) "The life of *E. rudis* is short. As soon as the tree attains any dimension, decay sets in."

E. brachypoda Turcz. is a party to the *rudis-rostrata* confusion. The original description is not easily accessible, and is given herewith.

Eucalyptus brachypoda. Caule ramoso glabro, ramis teretibus glaucescentibus; foliis alternis petiolatis, oblongo-lanceolatis, marginatis inæquilatis, longe acuminatis, basi attenuatis, opacis, glaucis; umbellis axillaribus 2-4 floris, pedunculis compressiusculis petiolo plus quam duplo brevioribus; pedicellis incrassatis cupulæ longitudine; operculo ruguloso conico acutiusculo cupulæ campanulatae æquilato et fere duplo longiore; staminibus cupulam bis excedentibus; capsulæ vertice exserto conico. Species cum descriptione *E. Gunnii*, Hook. fil. in multis quadrat, sed pedunculi folio plus quam duplo, nec paulo longiores. Operculum e cl. auctore non descriptum, in planta nostra exacte conicum a basi latiore ad apicem aequaliter attenuatum. Drum. 4, n. 73 (Turcz. in *Bull. Soc. Nat. Mosc.* xxii. 1849, pt. 2, p. 21).

Then Bentham describes it in B. Fl. iii, 223, giving *E. brevifolia* F.v.M., and *E. microtheca* F.v.M., as synonyms. In the combined description and list of localities, Bentham has included *E. rostrata* F.v.M., *E. microtheca* F.v.M., and perhaps *E. rudis* Endl. (at least as regards Drummond's 4th Collection No. 73).

Mueller in "Eucalyptographia" quotes *E. brachypoda* as a synonym of three species.

(a) Under *E. microtheca* F.v.M. he synonymises "*E. brachypoda* Benth. B.Fl. iii, 223 (partly)." Bentham himself attributes the species to Turczaninow.

(b) Under *E. rudis* Endl. he has "*E. brachypoda* Turcz."

(c) Under *E. rostrata* Schlecht. he has "*E. brachypoda* Turcz. not of Bentham."

Mueller expands his remarks under *E. microtheca*, and I have quoted them at Vol. ii, p. 51 of this work. At ii, 51, of the present work I have pointed out that Bentham had named two species under *E. brachypoda*.

Since the above was written, I have received from Dr. A. B. Rendle, Keeper of Botany, British Museum, London, another specimen of Drummond's 4th Collection, No. 73. At ii, 51, I stated that I had seen a specimen of Drummond's 73 which had been named *E. rudis* by Mueller, and that I agreed with the determination. The British Museum specimen is named "*E. rostrata* var.," an error which is quite pardonable. The specimens are not good, consisting of flower-bearing twigs with a few buds. These buds are small and short, and it is quite easy to confuse them with buds of *E. rostrata*, namely those ovoid, slightly pointed buds which are often seen in *E. rostrata*. One can, without difficulty, obtain in the Perth district specimens which match the not perfectly satisfactory ones of Drummond's iv, 73, and which connect with the type. I reiterate that Drummond's specimen is *E. rudis*. Bentham made a mistake in making *E. brachypoda* Turcz. (founded on Drummond's specimen) synonymous with *E. microtheca* F.v.M., which he was led into by the pale-green foliage of Drummond's specimen.

2. With *E. Campaspe* S. le M. Moore.

In Part xvi, p. 204, I drew attention to the fact that Mr. Moore suggested the affinity of his species to *E. rudis*; I will now be convenient to compare the figures of of *E. rudis* with those of *E. Campaspe* in Plate 71.

E. Campaspe is a somewhat scrambling, intensely glaucous, dry-country species; in all these points different to *E. rudis*. The timber of *E. Campaspe* is red and the tree generally resembles *E. salmonophloia*.

The opercula in *E. rudis* are usually conoid and rarely ovoid, and never hemispherical as in *E. Campaspe*, whose buds do not have a marked commissural line. The anthers possess reasonable similarity except that the filaments are versatile in *E. rudis*. The fruits of *E. rudis* have terete, usually long peduncles and pedicels, while those of *E. Campaspe* are much shorter and the peduncles broad. The fruits of *E. rudis* have the calyx-tube more sunk; they are urceolate when ripe, those of *E. Campaspe* are hemispherical.

3. With *E. Kirtoniana* F.v.M.

E. rudis may be compared with *E. Kirtoniana* (Part xxix, Plate 123). The two trees differ in the more fibrous bark and the redder timber of *E. Kirtoniana*. The juvenile leaves of *E. Kirtoniana* are more elliptical than are those of *E. rudis*. In the immature fruit of *E. Kirtoniana*, the style is more uniformly persistent. In *E. Kirtoniana* buds the commissural line, which is usually present in those of *E. rudis*, is absent. The greatest similarity is in the fruits.

4. With *E. ovata* Labill.

E. rudis and *E. ovata* are undoubtedly correlated species. Both are Swamp Gums, and in habit and general appearance, and even in timber, they resemble each other a good deal. They possess considerable similarity in the foliage, both juvenile and adult; compare Plate 113, Part xxvii. Both species vary a good deal in size of buds, and both have marked commissural lines. The larger fruits of *E. rudis*, e.g., figure 8 of Plate 138, and figure 2c of Plate 139, display considerable resemblance to those of *E. ovata* var. *grandiflora* Maiden; see figure 2d of Plate 114. On the other hand the fruits of *E. ovata* are on the whole more conoid; those of *E. rudis* being more urceolate, but in both species both shapes are to be found. *E. rudis* appears to be closest related to *E. ovata* of all species, and its affinities are being further inquired into.

DESCRIPTION.

CLXX. *E. Dundasi* Maiden.

IN *Proc. Royal Soc., N.S.W.*, xlix, 309 (1915).

ARBOR silvas formans, "Blackbutt" vocata. Foliis pedunculatis, angusto-lanceolatis, acuminatis, plerumque apice falcata, nitentibus, coriaceis, venis obscuris. Petiolis 1–1.5 cm. longis, foliis 8–9 cm., minus 1 cm. latis. Alabastris perfecte apertis non visis, sessilibus vel pedicello brevissimo, petiolo communi paullo plano et circa 1 cm. longo. Cupula circa .5 cm. longa, gracile, in apicem angustata. Operculo acuminato, conico et dimidio cupulæ æquilongo. Antheris paralleliter aperiuntibus, dorso glandula magna juxta apicem. Fructibus cylindroideis, medio paullo constrictis, .7 cm. longis et circa .4 cm. latis orificio. Valvarum apicibus non super orificium.

This is a tree of which Dr. L. Diels gave me a few leaves, buds and fruits (all entirely glabrous), in the year 1901, together with the following particulars. It is his No. 5454, and is "a tall tree forming forests" in the neighbourhood of Dundas, W.A., where it goes under the name of "Blackbutt."

Dr. L. Diels and Pritzel speak of their No. 5454 in terms of which the following is a translation :—

"We observed a very similar tree-like form (to *E. gracilis* F.v.M.) about 50 kilometres from Esperance Bay towards the north. It is a tree about 25 metres high, with a dark tessellated bark, called Blackbutt by the colonists, forming open forests in gravelly muddy country (D. 5454 in Berlin Herbarium). The tree next to our species is one from Eastern Australia mentioned by Mueller in Dec. iii of the 'Eucalyptographia' from the Mackenzie River, Queensland." (This is *E. Thozetiana* F.v.M.—J. H. M.) (*Engler's Jahrbuch* xxxv, 438, 1905.)

I may say that the name of "Blackbutt" is, in Western Australia, usually applied to *E. patens*, Benth, of the well-watered south-west, but, in the later settled arid goldfields area, the name is given more or less loosely to several (perhaps many) species, as it is a common character of trees of that region to have somewhat smooth trunks, with more or less dark, flaky bark on the butt, and these are called "Blackbutts."

The Dundas specimens may be described as follows :—

Juvenile leaves not available.

Mature leaves.—Only eleven leaves were received. They are pedunculate, narrow-lanceolate, acuminate, usually with a hooked tip, shiny, equally green on both sides, moderately rich in oil, venation scarcely visible, margin thickened, midrib the only obvious vein, lateral veins roughly parallel and acutely attached to the midrib. Petioles 1–1.5 cm., length of leaves 8–9 cm., breadth under 1 cm.

Flowers.—Buds not fully developed are alone available. Brownish-black in colour, sessile or with a very short pedicel, the common petiole slightly flattened and about 1 cm. long. The calyx-tube about .5 cm. long, slender, and tapering very gradually; the operculum pointed, conical, and about half the length of the calyx-tube. The anthers are immature, but they open in parallel slits and have a large gland at the back near the top.

Fruits.—Three fruits are available, picked off the ground and somewhat weather-worn. Cylindrical, slightly constricted in the middle, with some indistinct ribs, in very low relief below the constriction, .7 cm. long, and about .4 cm. broad at the orifice. Tips of the valves not appearing above the orifice.

Habitat.—The village of Dundas, Western Australia, after which the species is named, is situated 15 miles south of Norseman, on the Esperance road, and was the centre of the early mining operations on the Norseman field.

AFFINITIES.

I have not obtained additional material, although I have tried, at intervals extending over a number of years. I cannot identify it with any described species, and I think it should be given a name.

A species cannot be satisfactorily defined unless its affinities are indicated, and if the material and data (*e.g.*, concerning the timber) fall short of completeness, the suggestions as to affinities must of necessity be tentative.

The present is one of the narrow hook-leaved species of which there are not a few more or less uncinata, *e.g.*, *E. uncinata*, Turcz. (in which the hooks were thought to be characteristic of the species); *E. oleosa* F.v.M. (especially some of its narrow-leaved forms); *E. angustissima*, F.v.M.; *E. calycogona*, Turcz. var. *gracilis*, Maiden; *E. cneorifolia*, DC.; *E. Moorei*, Maiden and Cambage.

1. With *E. Clelandi* Maiden.

This is another goldfields "Blackbutt," and it is depicted at Part XVI of my "Critical Revision." The species are quite distinct, *E. Clelandi* being glaucous, with dull foliage, ribbed buds (particularly the opercula). The fruits of *E. Clelandi* are nearer than the buds to those of *E. Dundasi*, but the former are not constricted in the middle and otherwise differ somewhat in shape. The buds of *E. Clelandi* are immature, and the immature anthers are, in that state, not dissimilar to the immature anthers of *E. Dundasi*.

2. With *E. oleosa* F.v.M.

At Plate 66, fig. 2 of this work, a narrow-leaved form of this species is depicted, which displays considerable superficial resemblance to the present form. It is an aberrant form of *E. oleosa*, but one hesitates to give it a varietal name. It differs from *E. Dundasi* in the anthers and also in the buds and fruits.

DESCRIPTION.

CLXXI. *E. pachyloma* Benth.

IN B. Fl. iii, 237 (1866).

THE description will be found at Vol. 1, p. 200, of the present work, and need not be repeated here. I there looked upon it as a synonym of *E. diversifolia* Bonpl., a view I abandoned (*Journ. W.A. Nat. Hist. Soc.* iii, p. 166, Jan., 1911) after my visit to Western Australia in 1909.

Since writing this paper I have ascertained that Mueller's plate of *E. santalifolia* F.v.M. in the "Eucalyptographia" is *E. pachyloma* Benth.

As *E. diversifolia*, *E. santalifolia* and *E. pachyloma*, have been very much confused, the following statement may be useful.

E. diversifolia Bonpl. (*E. santalifolia*, F.v.M.).

The writers who have dealt with this species are :—

1. Bonpland, who first described it under the name of *E. diversifolia* in 1813,* and his descriptive account is reproduced in my "Critical Revision of the Genus Eucalyptus" (hereinafter called *Crit. Rev.*), Part vii, p. 197.

2. Mueller, who in 1855 redescribed the species under the name of *E. santalifolia* (see *Crit. Rev.* vii, p. 199). In his "Eucalyptographia" he figures *E. pachyloma* Benth. as his *E. santalifolia*, and makes a number of consequential errors in the text.

"*E. santalifolia* and *E. pachyloma*, though placed widely apart and in different sections of his anthereal system by Bentham are, as far as I can judge, quite identical." (Mueller in *Eucalyptographia*).

We have Bentham's authority for the statement (B. Fl. iii, 206) that "*This (E. santalifolia) is now reduced by F. Mueller to a form of E. obliqua*, but besides the foliage the shape of the fruit is different, being nearly that of *E. macrorrhyncha* or *E. capitellata*."

This is additional evidence that Mueller did not really know his own species, and, indeed, it is a very great advantage to a botanist to see the species in the field.

3. Bentham (B. Fl. iii, 240) added *E. diversifolia* as a synonym of *E. viminalis* Labill., under which he erroneously included other species (see this work, Part xxviii, 172). He also furnished a description of *E. santalifolia* F.v.M. at B. Fl. iii, 206, and additional notes at pp. 217 and 230, which are explained in Part vii, 199, 200. Some of his material was probably mixed.

* This work bears the date 1813 on the title page, but the latter parts were not published till 1816. (B. Fl. iii, 119.)

4. The French botanist, Naudin, who had access both to Bonpland's original specimens of *E. diversifolia* and to the progeny therefrom, wrote two papers:—

(a) "Mémoire sur les Eucalyptus introduits dans la région Méditerranéenne" [*Ann. des Sc. Nat.* 6° Sér. Bot, t. xvi (No. 6), p. 413 (1883)].

(b) "Description et emploi des Eucalyptus introduits en Europe principalement en France et en Algérie" (Antibes, 1891).

(a) is quoted as 1st Mem., and (b) as 2nd Mem.

Naudin's remarks are valuable, not only because of his valuable contributions to a knowledge of the genus, but also because he was in possession of the French traditions as to *E. diversifolia*. Following is a translation of what he said:—

"*E. diversifolia* Bonpl. *Nav. et Malm.*, p. 35, tab. 13, DC. *Prod.* iii, 220. Species mistakenly identified with *E. viminalis* by Benth.

"A lofty tree (this is a slip; it only grows to 12-15 metres, according to his own showing—(J.H.M.)), the older bark falling off in ragged pieces, leaving the trunk smooth. Leaves in the juvenile stage opposite and sessile, oblong-elliptical; in the adolescent stage alternate, petiolate, lanceolate, slightly or not falcate, coriaceous, rigid, shining. Umbels axillary, pedunculate, often 9-11 flowered. Flowers shortly pedicellate. Operculum shortly conical. Fruit broadly turbinate, rather woody, flattened on the upper side. Capsule the same length as the calyx-tube, four-celled at the most, and opening with the same number of apertures. (The original of the above is in Latin.) It is one of his "biforme" species (*i.e.*, where the differences between the juvenile and adult leaves are much accentuated).

He then gives an expanded translation of the above referred to Latin in French. He then goes on to say, "This tree, that Mr. Benth. has confused with *E. viminalis*, from which it is very different, seems to me one of the least variable of the species. I have always found it uniform in the different gardens of Provence (Nice, Antibes, St. Raphael, Hyères, Toulon), as well as the nursery at Hamma, near Algiers, where it attains a height of 12-15 metres. It is certainly one of the first Eucalypts which has been introduced into France, perhaps the first of all, since it was in cultivation at la Malmaison from the beginning of the century, and it flourished when, in 1813, Bonpland published his descriptions of the plants of this establishment. The figure he gives of it also makes it easy to recognise. At the time the tree was also cultivated in the garden of the Marine at Toulon, and according to a note from M. Robert, then director of this garden, he had received it direct from la Malmaison. I owe the communication of this note to M. Chabaud, naval botanist of the St. Mandrier Garden, near Toulon (I have a specimen from this garden—J.H.M.), and it is this which has put me in the way of recognising the species.

"I have no information as to the forestry value of this species. So far, it is simply an ornamental garden-tree." (Naudin, 1st *Mém.*, 413.)

Naudin practically repeats the above, with the following addition:—

"Following Mueller, *E. diversifolia* Bonpl. would be confounded with *E. santalifolia* (Eucalyptographia). However, the species there described hardly agrees with the figure (it is really *E. pachyloma*, as I have already stated (J.H.M.)), nor with the description of this last work, where, among other differences, *E. santalifolia* is indicated as a mere shrub. But the species of this genus are so variable that I would not yet like to pronounce as to the identity or the non-identity of these two species." (2nd *Mém.*, 50.)

5. I attach a translation of what Dr. Diels and Pritzel said, for completeness sake, but it does not help us much.

"Mueller thought it (*E. pachyloma* Benth.) to be identical with *E. santalifolia*. This opinion, however, so far is hardly confirmed. The areas given by Mueller are widely separated, the South Australian localities being more than 1,000 miles distant from the Western Australian ones. I have not seen the plants." (*Engler's Jahrb.*, xxxv., 442, 1905).

6. The present writer, who has dealt with the species (a) this work, Part vii, 197 (1905), where he included both *E. santalifolia* and *E. pachyloma* in *E. diversifolia*, (b) in *Trans. Roy. Soc., S.A.*, xxxii, 279 (1908), (c) *Journ. W.A. Nat. Hist. Soc.*, iii, 166 (Jan., 1911), where he stated, "It is quite impossible to keep *E. pachyloma* as a synonym of *E. diversifolia*."

I travelled extensively in South Australia in 1907, and *E. diversifolia* was deliberately investigated by me. Similarly, when I made a prolonged tour of Western Australia in 1909, I made a special trip after *E. pachyloma*, as I considered it required further investigation.

Mueller and I are quite in agreement in considering *E. diversifolia* and *E. santalifolia* as conspecific, but he makes the following extraordinary excuse for suppressing Bonpland's in favour of his own name.

"The name of *E. diversifolia*, given by Bonpland, had to be discarded, although he described the species already in 1813, and had it illustrated by Bessa simultaneously, because the plant as defined by him represents that very young state in which, as in most species of *Eucalyptus*, the leaves pass from the broad form of juvenile plants into the narrow shape of the leaves, normal for adult trees. The illustration indicates well that the leaves of the young seedlings are opposite, sessile, and oval, a sort of characteristic, which is particularly applicable for the discrimination of specific forms also in this genus." (*Eucalyptographia* under *E. santalifolia*.)

Mueller not only suppressed *diversifolia* in favour of his own *santalifolia*, but many years later he included *pachyloma* with his species, and in the *Eucalyptographia* (under *E. santalifolia*) he goes on to make deductions as to the similarities and dissimilarities of his *E. santalifolia* (his "*Eucalyptographia*" species, and not his original species) with *E. capitellata*, *E. diversifolia* and *E. viminalis*, which are quite erroneous because of his wrong identification.

The flattened or horizontal rim in *E. diversifolia* is a character, although there is a tendency to convexity of the rim, which undoubtedly let Mueller into his mistake of confusing the species with *E. pachyloma*, a species in which this convexity is exaggerated. This flatness of the rim is well brought out in Bessa's plate, the fruits depicted being the small form often found in this species. Indeed there is much variation in size. The fruits of *E. diversifolia* have often corky tuberculate excrescences.

Some notes on distribution.—I have a specimen bearing the label, "*Eucalyptus diversifolia* Bonpland. Confondu par Bentham avec *E. viminalis*, et par Fd. Müller avec le *santalifolia* (Ch. Ndn.)" (Charles Naudin.) "Jardin de la Marine à Ste. Mandrier, Toulon" (France) (Ch. Ndn.). It is referred to already, and is quite typical.

As regards the range, indicated at pages 201 and 202 of Vol. i of my *Crit. Rev.*, the following additions and amendments may be made.

The Western Australian localities must be deleted, for *E. diversifolia* does not extend to that State, the references to that State belonging to *E. pachyloma*.

The specific Victorian locality near Cape Nelson is Mount Chaucer.

[At *Proc. Linn. Soc. N.S.W.* xxix, 768 (1904) I have drawn attention to a specimen of a sheet of mixed Western Australian material distributed by Preiss under his No. 252, some of which belongs to *E. patens* Benth. At all events none of the material distributed under No. 252 is either *E. pachyloma* or *E. diversifolia*, and the matter may be dismissed from the present investigation.]

Under South Australia it may be added that the type of *E. diversifolia* came from Kangaroo Island. Waterhouse's specimen (No. 4) was labelled "*E. viminalis* according to Bentham, *E. santalifolia* F.M.," by Mueller. Tate's specimen (No. 5) was labelled *E. santalifolia* by Mueller. I have recorded it from Cape Couedie (Dr. R. S. and Mrs. Rogers). See *Trans. Roy. Soc. S.A.*, xxxii, 279. I have since obtained it from American Beach (H. H. D. Griffith through J. M. Black) and Rocky River (Walter Gill).

The original locality given for *E. santalifolia* is "in the Mallee Scrub on the Murray River, on St. Vincent's and Spencer's Gulfs." (See *Crit. Rev.* vii, 199.) "A Scrub Mallee with dark bark, near East Wellington (River Murray), sent by Mr. J. M. Black, precisely matches the localities mentioned in *Crit. Rev.*, vii, 202, collected by Mr. Cambridge.

Miquel (*Ned. Kruidk. Archief.*, iv) added the localities "Salt's Creek" (I do not know the precise locality of this Salt Creek, but there are several in Eyre's Peninsula. J.H.M.) and "Marble Range, Port Lincoln," which is a locality in which I collected many specimens. In *Trans. Roy. Soc. S.A.*, xxxii, 279, I recorded that I found the species to be abundant between Port Lincoln and Lake Wangary, and described juvenile leaves, and made other morphological references.

It is the commonest Eucalypt between Port Lincoln and Lake Wangary, existing in the greatest profusion. The leaves of the seedlings vary a good deal, some of them being stem-clasping and quite broadish. On Thistle Island it is, say, 15 feet high, and with a stem diameter of 4 inches. It has grey, thin bark, which peels a little. The timber is pale throughout, darkening a little towards the centre. The sizes of the fruits vary. Dr. Rogers collected it at Cape Couedie (Kangaroo Island). Tate,* following Bentham, refers *E. Baxteri*, "established on Kangaroo Island samples," to this species. At p. 213, Part viii, of my "Critical Revision" I have referred it to *E. capitellata* Sm., and to this opinion I adhere until a view of better specimens than I have seen in various herbaria shows this opinion to be an erroneous one.

Proceeding further west, we come to Port Elliston (specimens from Dr. R. S. Rogers), about 100 miles west of Port Lincoln. The locality Venus Bay (quoted B.Fl. iii, 206) for *E. santalifolia*, is the bight formed about the mouth of Anderson Inlet, and is some miles further on. It is the nearest recorded locality towards Western Australia, unless the following locality (also Eyre Peninsula) should be nearer.

"Soap Mallee." "Some say the name is given because the wood is soft and rotten, but others, and they are more likely correct, because of the soapy appearance of the stem and branches; not very plentiful." Minnipa, Eyre's Peninsula (W. J. Spafford).

The specimen labelled *E. viminalis* var. *diversifolia* (No. 8, p. 201, Part vii, *Crit. Rev.*) came from Guichen Bay according to the late Mr. J. G. Luehmann, late Government Botanist of Victoria. See also B.Fl. iii, 206, where Bentham (following Mueller) records *E. santalifolia* from Guichen Bay. Guichen Bay has on its southern shore the

* *Trans. Roy. Soc. S.A.* vi, 141 (1883).

township of Robe, which is the most southerly South Australian locality known to me, and the nearest to the only recorded Victorian locality (Cape Nelson). I have specimens of *E. diversifolia* from Robe (C. D. Black through J. M. Black).

Figures 9, 10, 11 of Plate 36 are *E. pachyloma* Benth. so that it is not necessary to add much.

RANGE.

In the "Eucalyptographia," under *E. santalifolia* the following localities really belong to *E. pachyloma*. It is confined to Western Australia.

In sandy desert country, as also in scrubby valleys or on arid ridges near King George's Sound (Drummond); on the Williams River (Webb); near the Kalgan River (Oldfield); at the base of the Stirling Ranges (F.v.M.).

I have seen the following specimens :—

Western Australia.—Drummond's No. 64: Stirling Range (Mueller); west from Yetemerup, N. side of Stirling Range (A Morrison); King George's Sound (? Webb). I collected specimens from the Kalgan Plains, near the foot of the Stirling Range.

AFFINITIES.

1. With *E. diversifolia* Bonpl.

E. pachyloma is nearest to this species, and is a spindly sand-plain gum, not known to attain tree-size. Its leaves are thick-coriaceous, much more coriaceous than those of *E. diversifolia*. Its juvenile leaves are narrow-lanceolate, and although occasionally broader, they are shortly pedicellate and never as broad, nor as stem-clasping, nor as thin as those of *E. diversifolia*. What *E. pachyloma* is can be seen in the excellent plate of that species (under the name of *E. santalifolia*) in the "Eucalyptographia," and figures 9-11 of Plate 36 of the present work, stated in the legend of Part vii, p. 205, to be *E. pachyloma*, although at that time included by me under *E. diversifolia*.

2. With *E. Oldfieldii* F.v.M.

"Fruit sessile, depressed-globose, 7 to 8 lines diameter, with the very thick, broad convex and raised rim of *E. Oldfieldii*, but without any depressed centre, the capsule not sunk, and the small valves protruding as in *E. rostrata*." (Original description of *E. pachyloma*.) Benth placed it next to *E. Oldfieldii* F.v.M.

"Although Bentham puts his *E. pachyloma* in the series of Normales (Parallelantheræ), it belongs in reality to the Renantheræ, notwithstanding the lesser divergence of the anther-cells, because the anthers are heart-shaped, not at all ovate. Their slits are convergent and fully joined at the summit. The connective is obliterated in front, so as to render the anther-cells then completely contiguous, and the seeds are nearly uniform in size, which all is quite characteristic of the Renantheræ. Indeed, *E. pachyloma* seems reducible to the true shrubby *E. santalifolia*, having precisely the same anthers also" ("Eucalyptographia," under *E. Oldfieldii*).

In this connection compare (for *E. pachyloma*) figures 9–11 of Plate 36, and (for *E. Oldfieldii*) Plates 73 and 74. The leaves of the former species are much the more rigid, and narrow; the juvenile leaves of *E. pachyloma* are never broadish as in *E. Oldfieldii*. The buds of *E. Oldfieldii* are usually in threes, and less conoid than those of *E. pachyloma*. The anthers of the two species are very different, and also the fruits, those of *E. pachyloma* being much more domed, spheroid, and with no concavity in the capsular rim as in *E. Oldfieldii*.

3. With *E. Morrisii* R. T. Baker.

See Plate 135, Part xxxii. *E. Morrisii* is a coarser plant than *E. pachyloma*; the foliage of the former is of a duller green; the juvenile leaves of the two species sufficiently resemble each other to require a word of caution. The mature leaves of *E. pachyloma* are more coriaceous and smaller than those of *E. Morrisii*. The buds of the latter species are more ovoid and more numerous in the umbel; the anthers are very different, while the fruits of *E. Morrisii* are smaller, more ovoid, and with the tips of the valves more cusp-like.

Explanation of Plates (136–139).

PLATE 136.

E. rostrata Schlechtendal.

(See also Plates 137 and 138.)

- 1*a*. Intermediate leaf; 1*b*, mature leaf ($9\frac{1}{2}$ inches long in its dry state). Gulpha Island, Mathoura, Murray River, N.S.W. (R. D. Hay).
- 2*a*. Mature leaf; 2*b*, buds with rostrate opercula; 2*c*, fruits. Moama, Murray River, N.S.W. [Nos. 1 and 2 are probably very close to the type.]
3. Twig with angled peduncle, very narrow leaf, and fruits. Bongbilla, Moulamein, Murray River, N.S.W. (Thomas Grieve).
- 4*a*. Short leaf, with umbel of three buds; 4*b*, front and back views of anthers. Mount Barker, S.A. (J.H.M.).
- 5*a*. Short leaf; 5*b*, umbel of nine buds. Wando Vale, Victoria (J. G. Robertson, 1st December, 1843).
6. Flat-rimmed fruits, leaves and buds normal. Latrobe River, Victoria (H. Hopkins).
7. Immature fruits. Near Lake Urana, N.S.W. (J. G. Luehmann, jun.).
- 8*a*. Buds with long, pointed opercula; 8*b*, fruits with the usual convex rims; 8*c*, fruits with no convex rims. 12 miles out from Temora, on the road to Grenfell, N.S.W. (Rev. J. W. Dwyer, No. 142).
- 9*a*. Buds with long-pointed opercula; 9*b*, leaf with fruits with small rims; 9*c*, larger fruits with well-marked rims. 9*b* and 9*c* show great variations in the fruit. Dirt Hole Creek, Rye Park, near Burrowa, N.S.W. (V. Roberts).
- 10*a*, 10*b*. Juvenile leaves. Bowning, N.S.W. (Andrew Murphy).

PLATE 137.

E. rostrata Schlecht.

(See also Plates 136 and 138.)

1. Short, pointed buds. Wooyeo, Lake Cudgellico, N.S.W. (G. Stirling Home).
2. Wide-rimmed, sharp edge fruit (the buds normal). Euabalong, N.S.W. (J. L. Boorman).
- 3a. Leaf; 3b, starved buds; 3c, normal buds; 3d, fruits. Nyngan, N.S.W. (W. Baeuerlen). These specimens were given to me by Mr. R. T. Baker as typical of his var. *borealis*, which does not morphologically differ (as Mr. Baker says, p. 68) from normal *rostrata*.
- 4a. Conoid buds; 4b, fruits. Nyngan (District Forester C. Marriott).
- 5a. Mature leaf; 5b, intermediate leaf; 5c, buds; 5d, fruits. Banks of the Bogan River, Nyngan (J.H.M.).
- 6a. Small buds with slender pedicels; 6b, small fruits. Namoi River, N.S.W. (Dr. H. I. Jensen).
7. Intermediate leaf. Moree, N.S.W. (J. L. Boorman).
8. Leaf, buds and flowers. Glenelg River, Victoria, not far from South Australian border (Mueller). This is the type of his var. *brevirostris*, and it will be seen that it is normal *rostrata*.
- 9a. Intermediate leaf; 9b, narrow mature leaf; 9c, nearly ovoid buds; 9d, fruits. Mt. Lyndhurst, South Australia (Max Koch).
10. Conoid buds of explorer Hovell's tree, marked by him in 1824 near the modern Albury, N.S.W. (J. R. Fellows).
- 11a. Unusually short leaf; 11b, conoid buds. From a Silurian hill close to the Yarra, Victoria (A. D. Hardy).
- 12a. Conoid buds; 12b, broad, flat-rimmed fruits. Hargraves, N.S.W. (Andrew Murphy).
13. Ovoid buds. Sandy Creek, 14 miles north of Gilgunnia, N.S.W. (R. H. Cambage, No. 1012). See *Proc. Linn. Soc. N.S.W.*, xxvi, 206 (1901).
14. Fruits less ovoid, nearly normal. Broken Hill, N.S.W. (Assistant Forester H. W. Garling).
15. Broad-rimmed fruits, with well-cusped valves. Gunn Creek, Poolamacca, Barrier Range, N.S.W. (C. J. McMaster).
16. Buds, nearly normal. Grey Range, N.S.W. (W. Baeuerlen).
17. Almost globular buds. Finke River, Northern Territory (Rev. H. Kempe).
18. Normal fruits. Jay Creek, Northern Territory (G. F. Hill, No. 115).

PLATE 138.

E. rostrata Schlecht. var. *acuminata* var. nov.

(See also Plates 136 and 137.)

- 1a. Leaf; 1b, acuminate buds of var. *acuminata* (*E. acuminata* Hook.). From "Journal Tropical Australia," p. 390 (Mitchell).
2. Leaf and buds, aff. var. *acuminata*. Bullock Creek, 25 miles north-west of Trundle, N.S.W. (R. H. Cambage, No. 1014).
- 3a. Leaf; 3b, buds, aff. var. *acuminata*, though less close than No. 2. Stannary Hills, North Queensland (Dr. T. L. Bancroft).

E. rudis Endl.

(See also Plate 139.)

4. Twig, being portion of Preiss' No. 252 (1843), *the type*.
5. Twig in early fruit, showing sunk capsule. (Drummond's No. 58).
- 6a. Leaf; 6b, buds; 6c, anther (Drummond's No. 73, 4th collection).
7. Twig with urceolate fruit, the capsule well sunk. Vasse River, W.A. (Gilbert Collection, 1842, in Vienna Herbarium).
8. Fruits, flat-rimmed. Vasse River, W.A. (Dr. L. Diels, No. 2655).
- 9a. Juvenile leaf; 9b, narrow mature leaf. Serpentine, near Perth, W.A. (Dr. J. B. Cleland). (See No. 1, Plate 139.)

PLATE 139.

E. rudis Endl.

(See also Plate 138.)

- 1*a*. Broad mature leaf and buds; 1*b*, urceolate young fruit. Serpentine, near Perth (Dr. J. B. Cleland).
- 2*a*. Ovoid buds; 2*b*, conoid buds; 2*c*, small, slightly domed fruits; 2*d*, larger fruits with sunk rim.
All collected from the same tree. South Perth (J. H. M.).
3. Globular to pear-shaped fruits, valves much exsert, 10 in the head. Bellevue, near Perth (Dr. L. Diels, No. 2,723, as *E. rostrata*).
- 4*a*, 4*b*. Broad leaves; 4*c*, buds. Subiaco, Lower Swan River. (Dr. A. Morrison.)
5. Small, sharp-pointed buds. Herdsman's Lake, near Perth. (Cecil Andrews.)
6. Conoid buds. Capel, W.A. (Forest Ranger Donovan.)
7. Broad, squat buds. Banks of Avon River at Beverley, W.A. (Dr. F. Stoward, No. 270.)
8. Small fruits. York, W.A. (O. H. Sargent, No. 322.)
- 9*a*. Intermediate leaf; 9*b*, buds and mature leaf. Banks of the Irwin River at Dongarra, W.A. (J.H.M.)
10. Conoid buds. Between Ebbano and Yandanooka, Victoria district, W.A. (Dr. A. Morrison.)
11. Domed, spheroid fruits. Northampton, W.A. (J.H.M.)

E. Dundasi Maiden.

- 12*a*. Twig, with buds; 12*b*, leaf, showing venation; 12*c*, fruits. Dundas, W.A. (Dr. L. Diels, No. 5,454.)
The type.

E. pachyloma Benth.

- 13*a*. Juvenile leaf; 13*b*, juvenile leaf, a stage further advanced. Kalgan Plains, near foot of Stirling Range, W.A. (J.H.M.)
For other figures of this species, see figs. 9, 10, 11 of Plate 36.

The following species of *Eucalyptus* are illustrated in my "Forest Flora of New South Wales"* with larger twigs than is possible in the present work; photographs of the trees are also introduced wherever possible. Details in regard to their economic value, &c., are given at length in that work, which is a popular one. The number of the Part of the Forest Flora is given in brackets :—

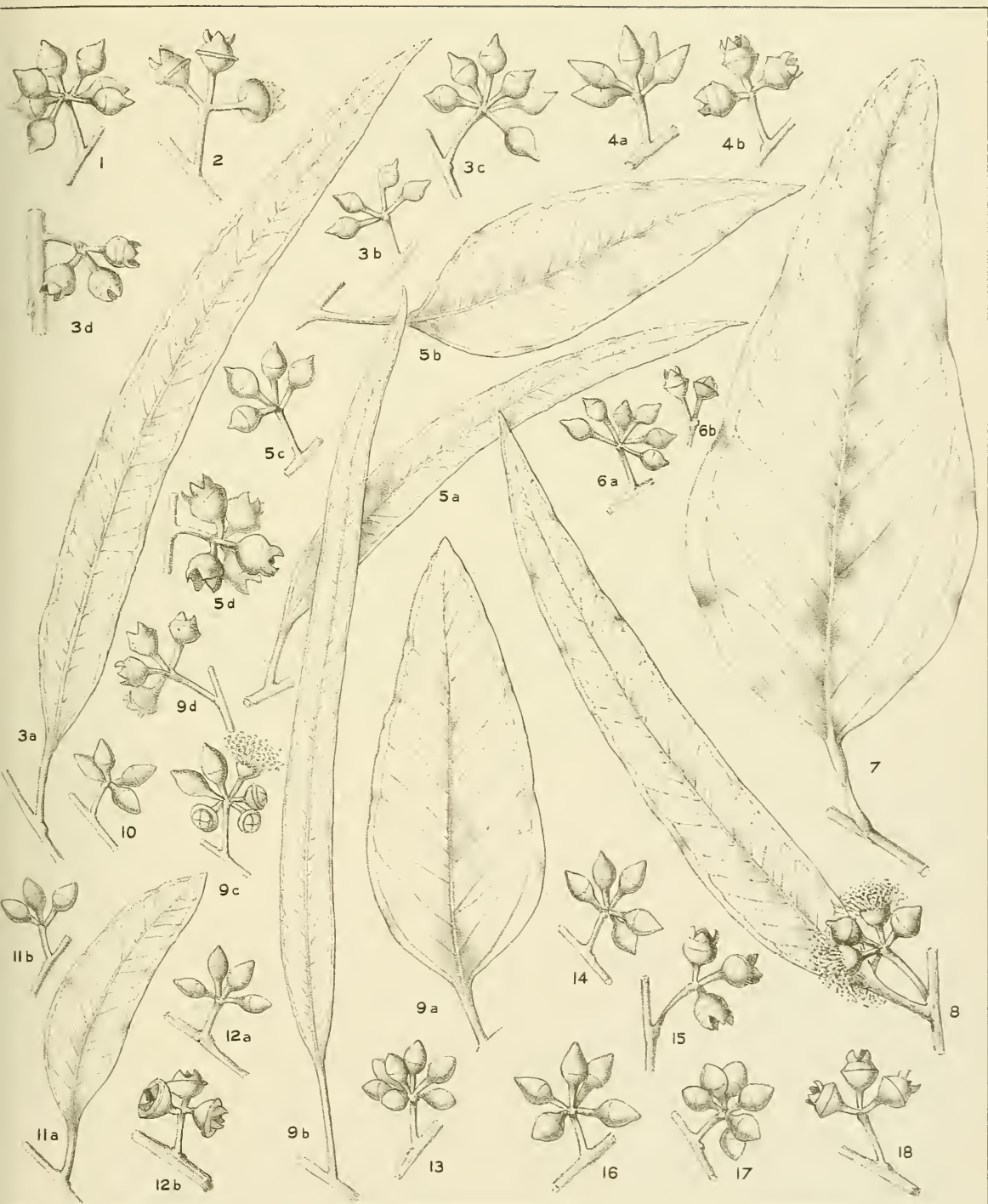
<i>acacioides</i> A. Cunn. (xlviii).	<i>melanophloia</i> F.v.M. (liv).
<i>acmenioides</i> Schauer (xxxii).	<i>melliodora</i> A. Cunn. (ix).
<i>affinis</i> Deane and Maiden (lvi).	<i>microcorys</i> F.v.M. (xxxviii).
<i>amygdalina</i> Labill. (xvi).	<i>microtheca</i> F.v.M. (lii).
<i>Andrewsi</i> Maiden (xxi).	<i>numerosa</i> Maiden (xvii).
<i>Baileyana</i> F.v.M. (xxxv).	<i>obliqua</i> L'Hérit. (xxii).
<i>Baueriana</i> Schauer (lvii).	<i>ochrophloia</i> F.v.M. (l).
<i>Baueriana</i> Schauer, var. <i>conica</i> Maiden (lviii).	<i>odorata</i> Behr and Schlechtendal (xli).
<i>Behriana</i> F.v.M. (xlv).	<i>oleosa</i> F.v.M. (lx).
<i>bicolor</i> A. Cunn. (xlv).	<i>paniculata</i> Sm. (viii).
<i>Boormanii</i> Deane and Maiden (xlv).	<i>pitularis</i> Sm. (xxxi).
<i>Bosistoana</i> F.v.M. (xliii).	<i>piperita</i> Sm. (xxxiii).
<i>Caleyi</i> Maiden (lv).	<i>Planchoniana</i> F.v.M. (xxiv).
<i>capitellata</i> Sm. (xxviii).	<i>polyanthemos</i> Schauer (lix).
<i>Consideniana</i> Maiden (xxxvi).	<i>populifolia</i> Hook. (xlvii).
<i>coriacea</i> A. Cunn. (xv).	<i>propinqua</i> Deane and Maiden (lxi).
<i>corymbosa</i> Sm. (xii).	<i>punctata</i> DC. (x).
<i>crebra</i> F.v.M. (liii).	<i>regnans</i> F.v.M. (xviii).
<i>dives</i> Schauer (xix).	<i>resinifera</i> Sm. (iii).
<i>fruticetorum</i> F.v.M. (xlii).	<i>rostrata</i> Schlecht. (lxii).
<i>gigantea</i> Hook. f. (li).	<i>saligna</i> Sm. (iv).
<i>goniocalyx</i> F.v.M. (v).	<i>siderophloia</i> Benth. (xxxix).
<i>hæmastoma</i> Sm. (xxxvii).	<i>sideroxylon</i> A. Cunn. (xiii).
<i>hemiphloia</i> F.v.M. (vi).	<i>Sieberiana</i> F.v.M. (xxxiv).
<i>longifolia</i> Link and Otto (ii).	<i>stellulata</i> Sieb. (xiv).
<i>Luehmanniana</i> F.v.M. (xxvi).	<i>tereticornis</i> Sm. (xi).
<i>macrorrhyncha</i> F.v.M. (xxvii).	<i>virgata</i> Sieb. (xxv).
<i>maculata</i> Hook. (vii).	<i>vitrea</i> R. T. Baker (xxiii).

* Government Printer, Sydney. 4to. Price 1s. per part (10s. per 12 parts); each part containing 4 plates and other illustrations.



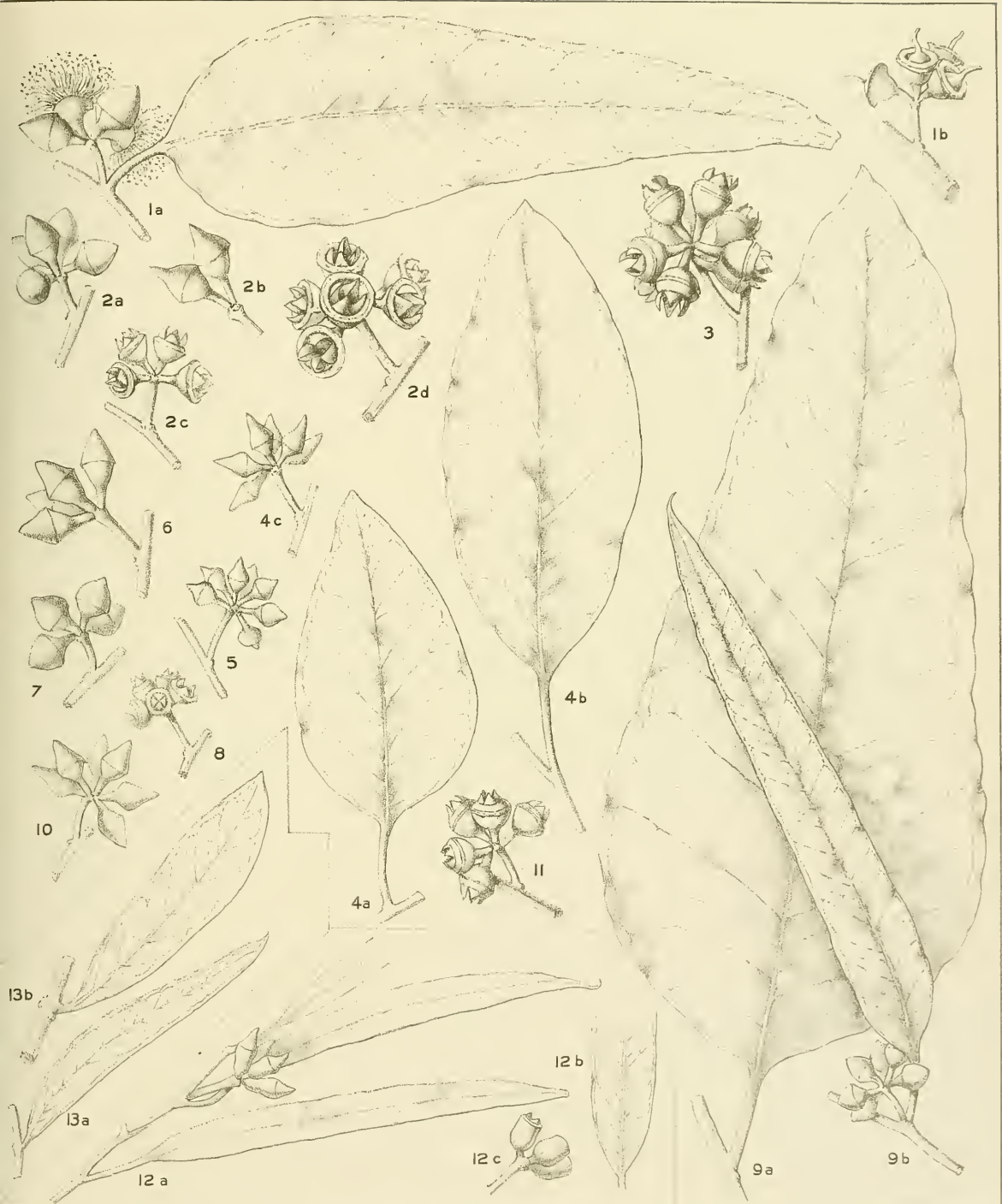
M. FLECHER, del. et lith.

EUCALYPTUS ROSTRATA SCHLECHT. [See also Plates 137 and 138.]



M. Flockton. del. et lith.

EUCALYPTUS ROSTRATA SCHLECHT. [See also Plates 136 and 138.]



M. Flockton del. et lith.

EUCALYPTUS RUDIS ENDL. (1-11). [See also Plate 138.]

E. DUNDASI MAIDEN. (12).

E. PACHYLOMA BENTH. (13). [See also figs. 9, 10, 11 of Plate 36.]

DESCRIPTION.

CLXXII. *E. redunca* Schauer.

IN *Lehmann's Plantæ Preissianæ* i, 127 (1844).

FOLLOWING is a translation of the original :—

Shrubby, leaves somewhat rigid, alternate, lanceolate, inequilateral, narrowed into a petiole, acuminate, glaucous on both sides (the midrib and the margin of a different colour); umbels lateral or axillary, 6-12 flowered, peduncles flattened, two-edged, about $\frac{1}{2}$ inch long; calyx-tube cylindrical; operculum awl-like conical, coriaceous, shining, twice as long and more than the calyx-tube, the point, at least in the early full-grown bud, bent back (redunco) or twisted.

In interior districts between King George's Sound and York, in the month of October with nearly adult buds (Herb. Preiss. No. 234); February and March with young buds (Nos. 245 and 247); in gravelly sterile land on the hill Konkoberup, near Cape Riche, fruiting in November. (No. 234).

A shrub a fathom high, branchlets angled, with the petiole and the margin and the rib of the leaves reddish-yellow. The leaves 3-4 inches long, 6-12 lines broad. Calyx-tube (with the pedicel of the bud continuous with it and of the same length, an inch long), measuring about 3 lines in breadth. Operculum 6-7 lines long, capsule 3-celled. Fruits umbellate, oblong-clavate, with the pedicel 6-7 lines long, above $2\frac{1}{2}$ lines broad, truncate; capsule included, valves erect, touching the mouth of the calyx-tube.

It was subsequently described in English by Bentham in B. Fl. iii, 253, and also by Mueller in "Eucalyptographia," with a figure.

The typical form of the species is known as "Black Marlock," and is a dwarf scrubby shrub (the type was a fathom high). Juvenile foliage broad, ovate-acuminate, petiolate, venation well marked, intramarginal vein at a considerable distance from the edge, pinnately veined. Long opercula. Cream flowers whose filaments dry brownish or brownish red. Said to be a constant associate of Poison (*Gastrolobium velutinum* Lindl.) (Maiden in *Journ. W.A. Nat. Hist. Soc.* iii, Jan., 1911).

Generally the veins are inconspicuous and the general appearance of the foliage dull, but exceptionally it may have some lustre, and the venation may be very prominent.

The tips of the valves may just emerge from the orifice.

SYNONYM.

E. occidentalis Endl., var. *oxymitra* Diels. *Oxus*, sharp, *mitra*, a mitre (applied to the calyptra in certain mosses) hence, as applied to Eucalyptus, a sharp or pointed operculum.

Specimens from "Phillips River in Eucalyptus scrubs in sandy places" (Dr. L. Diels, No. 4885) have been distributed by Dr. Diels under the above name, but I cannot trace any published description of the reputed variety.

RANGE (of type form).

In its typical form I doubt if *E. redunca* occurs north of the sand-plains of the south-west and south. It is somewhat vaguely described as from between King George's Sound and York, and also from Cape Riche, Konkoberup being Mount Melville, Cape Riche.

Dr. L. Diels' No. 3486, "1 metre high," comes from Cape Riche. Nine-Mile Tank, or Dam (on the railway, going north from Hopetoun) (J.H.M.), is the most easterly locality known to me, with the exception of the Phillips River.

"Black Marlock." Cream filaments, those of one flower turning red. N.B., in drying they have all turned reddish brown. Kalgan Plains, also Kalgan River, where it is very abundant. (J.H.M.). These are dwarf, bushy shrubs with lanceolate leaves. Very broad peduncles. The same, vicinity of the Porongorups. (J.H.M.). A dwarf shrub of 3 or 4 feet, in bud only.

Dr. E. Pritzel's No. 470 is from the "South-west Plantagenet district"; Drummond's Nos. 81 and 84, and Tenterden (Great Southern Railway) are all from the same general area.

"Shrub of 7-8 feet. Main road between Gnowangerup and Broome Hill. (Dr. F. Stoward, No. 126). "Conspicuous shrub 6-7 feet in height, sparsely scattered over the plain. Sand plain, elevated land near road-side, main road, 2-3 miles west of Ongerup" (Dr. F. Stoward, No. 127).

VARIETIES.

1. Var. *elata* Benth.
2. Var. *angustifolia* Benth.
3. Var. *melanophloia* Benth.
4. Var. *oxymitra* var. nov.

1. Var. *elata* Benth.

A large tree, the trunk generally swelling out suddenly near the ground, forming a kind of pedestal, the bark smooth, white, decorticating in long chartaceous pieces (Oldfield). Operculum rather shorter and the fruit less contracted at the orifice, but not differing otherwise from the normal form. Kalgan River, "White Gum," *Oldfield* (B. Fl. iii, 253).

This is the only variety of the species which is of special economic importance. The swelling out of the trunk, usually at no great distance from the ground, with a tumour-like excrescence, seems to be characteristic, and is readily brought out in a

photograph. Tumours like these often contain a watery liquid, and Capt. J. Lort Stokes, R.N., "Discoveries in Australia, 1837-43," vol. ii, 132, calls the tree "White Gum" or "Wando" (native name), and says "Found on stiff clay lands, sometimes tapped for water contained in the hollow trunk."

The native name is now usually spelt "Wandoo," and is very often applied to the tree and its timber.

Mueller speaks of it attaining a height of 120 feet in rich and deep soil, and on another occasion says, "the stem is known to have occasionally attained a diameter of 17 feet."

The timber is a Jarrah substitute. Enthusiastic people pronounce it to be more durable and even better than Jarrah, when used for posts, &c. It is a pale (drying dark brown), hard, particularly tough, interlocked, heavy and durable timber, prized for building purposes, various implements, and especially for wheelwrights' work, supplying the best shafts, cogs, naves, spokes, and felloes. The seasoned wood weighs about 70 lb. per cubic foot. Mr. Allen Ransome examined a sample of this timber sent to the Colonial and Indian Exhibition. He reports: "It is very similar to Tuart (*E. gomphocephala*). Felloes were shaped, and spokes were turned from it, the finish being, if anything, superior to that of Tuart." Splits radially in drying.

It is the commonest tree about Broome Hill, where it attains a good size. The local people speak of it as the most valuable timber in Western Australia. It splits radially in drying.

Its bark is smooth and white, with grey patches, and it is used as a Mallet adulterant.

Mr. H. G. Smith has a note on the tanning value of the bark of this species, which he calls "White Gum," in the *Journal of Agriculture, W.A.*, April, 1905, p. 219. He speaks of it as a somewhat thick bark, grey to brown externally, and with a fracture of a yellowish colour. He gave the tannin value as 12.86 per cent.

RANGE (of var. *elata*).

Mueller (*Eucalyptographia*) extends the range "fully to the Murchison River, the prevailing tree on the eastern tiers of the ranges and on the adjoining flats . . . estimated by the Lands Department to occupy naturally about 10,000 square miles . . . is for its growth content with cold flats of comparatively poor soil, even where humidity stagnates in the wet season."

Kalgan River, W.A. (Augustus Oldfield, No. 331). "White Gum," Kalgan, W.A. (Oldfield, No. 342). These specimens are co-types of the variety. It is common about the Kalgan River, where I collected it. This locality is about 35 miles north-east of Albany.

Broome Hill, Great Southern Railway (Dr. A. Morrison). Glabrous, broadly lanceolate, pedicellate mostly, not acuminate. Broome Hill (J.H.M.).

Then we go about 65 miles west to a locality 14 miles east of Bridgetown (J.H.M.). Darling Range, near Darlington (Dr. A. Morrison).

"Wandoo" or "White Gum." Arborescent, with widely spreading branches, 80 feet high, 3 feet diameter. Bark white with grey patches. Sandy or poor soil. Narrow-lanceolate to broader leaves. Midland Junction (W. V. Fitzgerald).

"White Gum." "Spotted Gum," "Some (rough) bark at base." Kelmscott (Dr. J. B. Cleland; Dr. A. Morrison). Hales' Selection, near Kalamunda. White Gum of fair size. Leaves lanceolate to broader (J.H.M.).

The following note includes a useful reference to the flowering period :—

The White Gum or Wandoo is chiefly found in a belt of the tableland country extending from the top of the hills for many miles eastward. It is distinguished by the bluish white colour of the outside of the bark and the rich yellow colour of the bark when cut. The wood is hard, tough, and bluish white in colour and very durable. It is very irregular in its blooming, and appears to be affected by seasons, bush fires and so forth, so that it may be blooming one year in one district and another year in another. The period of the year varies considerably; odd trees may be in bloom in July, August and September, but the period of full bloom appears to be from October to November, with odd trees later. It forms its buds two years ahead; that is to say, when a tree is in bloom, a neighbouring tree which bloomed the year before may have buds formed for the next year; and as soon as the bloom dies away another lot of buds may form for two years ahead, that is, if the tree is going to bloom then. Trees may bloom two years in succession, but as a rule there is full bloom roughly only once in three years. I have seen White Gums in bloom during every month of the year, although not in the same district or the same year. (Mr. A. H. Smith, of Baker's Hill, in *Western Mail*, Perth).

Five miles from Lake Yealering, on the Wickepin Road. Tree 40 feet, and up to 18 inches diameter (Dr. F. Stoward).

On sand, near Quellington (O. H. Sargent, No. 731). Talbot, near York. Timber drying to a pale red (O. H. Sargent).

"White Gum." Tree of 20 metres. Bark white. Foliage pendulous, sub-glaucous. Forming open woods with *Acacia acuminata*. Clackline, Avon (Dr. L. Diels, No. 2574). Avon district (E. Pritzel, No. 313).

Tree about 30 feet. White bark. York-Perth road, near Cut Hill, York, (O. H. Sargent, No. 279). Tree about 25 feet, smooth white bark. Growing on reddish chocolate soil, mixed with ironstone gravel at foot of hill near Cut Hill, York (O. H. Sargent, No. 284). Tree about 15 feet. Trunk bark dark brown, irregularly fissured like *E. foecunda*. Branches smooth, white. Foot of Mt. Bakewell, near York (O. H. Sargent, No. 440). Tree of 12 feet. Smooth whitish bark with rough grey-brown scaly pieces loosely adherent to the trunk. Rocky ground foot of Mt. Bakewell (O. H. Sargent, No. 638).

"White Gum." Green Hills (Dr. F. Stoward).

Glaucous. Juvenile leaves sessile, cordate at base, broadly lanceolate, acuminate. Northam (Forester J. H. Gregory).

Mogumber (Diels and Pritzel). Glaucous. West from Wongan Hills (Dr. A. Morrison).

2. Var. *angustifolia* Benth.

Leaves linear or linear-lanceolate.—*E. xanthonema* Turcz. in *Bull. Mosc.* 1817, i, 163; W. Australia, Drummond, 3rd Coll. n. 67, 5th Coll. n. 187; S. side of Stirling Ranges and eastward to Phillips Ranges, Maxwell. B. Fl. iii, 253.

SYNONYM.

Following is a translation of Turczaninow's original description:—

"*E. xanthonema* has round branches bare from the base to the inflorescence; leaves alternate, narrow-linear lanceolate, above the flowers, acuminate at both ends, green, pellucid-dotted, subfalcate, umbels axillary, five-flowered, arranged in a condensed panicle, peduncles erect (then very much deflected, compressed, much longer than the petiole and pedicels; pedicels the same length as the turbinate calyx-tube, operculum (immature) conical, the same length as the calyx-tube. Filaments remarkable for their reddish orange colour; habit unique. New Holland. Drummond's Collection, No. 67."

RANGE (of var. *angustifolia*).

The range of this variety requires to be defined. It certainly extends into dry country, drier perhaps than the other forms, except oxymitra.

I have examined Drummond's 67 (3rd coll.) and 187 (5th coll.) in various herbaria.

No. 67 has linear lanceolate leaves. Those of 187 are broader, and connect with the broader-leaved or typical form figured in the Eucalyptographia. No. 67 is the type of var. *angustifolia*. No. 187 was collected on a trip described as "Swan River to Cape Riche."

"Tree of 25 feet, with a rough greyish, persistent bark." Cunderdin (W. V. Fitzgerald). Lanceolate leaves and supple branchlets. "10 feet high." Same place, date and collector. Obviously the same species, but a more scrubby form. Some of the leaves broader.

(a) Near Knutsford, Elder Exploring Expedition (R. Helms, 9th December, 1891). Similar to the two preceding.

(b) Mr. Helms presented me with a specimen of the same species, collected on the same date, but labelled "20 feet, near Golden Valley" (which is the same as "near Knutsford"). Some of the leaves in this specimen are wider than those of (a).

It seems to me that *angustifolia* is not an entirely satisfactory variety.

3. Var. *melanophloia* Benth.

Leaves larger, more prominently veined. Murchison and South Hutt Rivers, a small tree with a smooth black bark, *Oldfield*. B. Fl. iii, 253.

Bentham (or perhaps Mueller) distributed this variety under the name var. *venosa*. For example, "Cheeanga thicket, South Hutt" (Augustus Oldfield). The South Hutt flows into the Geelvink Channel and is in the Geraldton district.

I do not look upon it as a useful variety, for example,

"7-8 feet high, 30-40 miles east of Katanning, just beyond Nyabing. It has oily green leaves. It is known locally as Mallee, and forms much of the denser undergrowth covering chiefly the gravelly ridges of this locality." (Dr. F. Stoward).

Buds with mark of fallen double operculum well accentuated. Carnamah (Midland Railway), Victoria district (Dr. A. Morrison, No. 20). Bud only.

4. Var. *oxymitra* var. nov.

The following is an interesting and anomalous form which one cannot fully describe in absence of fruits.

Broad Arrow (R. Helms, No. 102). In bud and flower only. Very long, curved, very acuminate opercula, often bent at the tips. Calyx-tube 5 cm. long, operculum 2.5 cm. Is an eastern form with sub-glossy, coriaceous leaves, the younger ones glaucescent. While a form of *E. redunca*, it undoubtedly shows some transition towards *E. occidentalis* var. *eremophila*.

AFFINITIES.

1. and 2. With *E. foecunda* Schauer and *E. spathulata* Hook.

The species, especially in the narrow-leaved forms, has much resemblance on the one hand to *E. foecunda*, on the other to *E. spathulata*, but is readily distinguished from the former by the operculum, from the latter by the stamens and the acuminate operculum. (B. Fl. iii, 253).

E. foecunda is a rough-barked species with a brownish timber. (See Part IV of the present work). *E. spathulata* will be dealt with in Part XXXV.

3. With *E. accedens* W. V. Fitzgerald.

This is the species with which *E. redunca* is closest related, and the relations will be gone into when *E. accedens* is reached, p. 101 below.

DESCRIPTION.

CLXXIII. *E. accedens* W. V. Fitzgerald.

In *Journ. W. A. Nat. Hist. Soc.*, i, 21 (May, 1904).

ARBORESCENT, attaining a height of 60 feet, with a stem diameter of 2 feet, the trunk crooked; branches slender, terete, or nearly so; bark smooth, persistent, greyish or white, splashed or blotched with a darker colour. Leaves alternate, ovate to lanceolate, falcate or straight, obtuse or shortly acuminate, thick, rigid, pale-green on both sides, under 4 inches long and obliquely rounded into a petiole of $\frac{1}{2}$ inch long, veins very fine, numerous, parallel, oblique, inconspicuous, the marginal one almost or quite at the edge. Peduncles axillary or lateral, solitary or rarely two together, terete, or slightly angular, $\frac{1}{2}$ -1 inch long, each bearing an umbel of 5-8 flowers. Calyx-tube broadly-turbinate or semi-ovate, about 3 lines long, tapering into a thick terete or scarcely angular pedicel of 1 line long. Lid hemispherical, very obtuse and rounded at the apex, yellowish, about half as long as the tube. Stamens about 3 lines long; filaments much inflected in bud, white or pale yellow; anthers oblong or elliptical with parallel distinct cells. Ovary very conical. Fruit turbinate or obovate, $3\frac{1}{2}$ -4 lines long, $2\frac{1}{2}$ lines diameter, slightly or not at all contracted at the summit, rim convex and thin, capsule sunk; valves usually four, deltoid, obtuse, the points on a level with the rim or scarcely exserted. Seeds angular, not winged, fertile ones greyish, $\frac{3}{4}$ line long and broad, sterile ones brown, $\frac{1}{2}$ line broad.

Locality.—Near Pingelly, November, 1903. W.V.F.

Remarks.—The species is vernacularly known as "Spotted Gum," and occurs on rising ground, usually associated with Mallert (*E. occidentalis* Endl.) Analysis of the bark has proved it to contain nearly 45 per cent. of tannic principle.

I believe that the juvenile foliage, shown in outline on the *E. redunca* plate in the "Eucalyptographia," really belongs to *E. accedens*.

The author has not described the juvenile foliage, but with the following description, and the figure 8, Plate 141, and figure 1, Plate 142, it should be quite clear.

Coarse, thick, glaucous, of the same colour on both sides, pedunculate, cordate at the base, cordate or orbicular in shape, intramarginal vein at a considerable distance from the edge, the secondary veins roughly parallel and making an angle of about 45 deg. with the midrib.

A specimen kindly supplied by Mr. C. E. Lane-Poole, Conservator of Forests of Western Australia, is pale reddish brown when fresh, hard, and interlocked. Like most timbers, it darkens somewhat with age.

RANGE.

It is confined to Western Australia. It is a species whose range is uncertain yet, because it has been often confused with *E. redunca*. At the present time we know it from Pingelly and York to the neighbourhood of Perth, and additional localities will doubtless follow. I have a fragment of a specimen from between the Greenough and Irwin Rivers, and it should be searched for between those rivers and Perth.

"Spotted Gum." "Bark contains nearly 45 per cent. of tannic principle." Near Pingelly (W. V. Fitzgerald). The type. In immature bud and fruit, and proper comparison with these particular specimens is not entirely satisfactory.

"Tree 30 feet or more. Smooth white bark." Near Cut Hill, York (O. H. Sargent, No. 359, 360, 763). "Species No. 359 I have found only on ironstone. Apparently it does not spread to the adjacent sand, which is occupied by *E. redunca*, a tree very similar in general appearance. Nor have I found it in the clayey soil on the other side of the hill where *E. redunca*, *E. calophylla*, and *E. loxophleba* occur. Height, 20-40, or, perhaps, 50 feet. Bark white or pale salmon." (O. H. Sargent). "Spotted Gum." "Tree of 30 feet with smooth, white pulverulent bark, bearing patches of brown dead bark." Cut Hill, York (O. H. Sargent, No. 733, *a, b, c*).

"Powder Bark." "Tree about 40 feet. Trunk smooth, opaque, buff-white, outer layer of bark readily rubbing off as a fine white powder." Ironstone hillock, Talbot Brook, near York. A moist locality. (O. H. Sargent, No. 762). "Tree about 30 feet. Smooth white trunk and branches, with adherent brown patches of dead bark." Mt. Bakewell, near York (O. H. Sargent, Nos. 757, 758). "Tree of 20-30 feet, smooth white or salmon bark on trunk and branches." Summit of Mt. Bakewell, York (O. H. Sargent, No. 701).

Mr. Sargent's specimens from Mt. Bakewell, which is about 3 miles from York, enable the following specimen collected by Mueller to be identified as *E. accedens*. "Cortex albo-colorans. Var., operculo obtusato. Fol. opaco. *E. redunca* (?) " Mt. Bakewell (Mueller, Nov., 1877).

"Powder-bark Wandoo," or simply "Powder-bark." Tree 80 to 90 feet and up to 3 to 4 feet in diameter. Of commercial value on account of its durability for naves and felloes for wheelwright work." Reserve No. 14275, near Coates, Eastern Railway (Dr. F. Stoward). Dr. Stoward adds: "Grows throughout Baker's Hill locality generally, on elevated, rough, ironstone country." Mr. A. H. Smith, Apiarist, and Mr. W. C. Grasby, *Western Mail*, send it from Baker's Hill, near Clackline. Called also "Bastard White Gum" (W. C. Grasby).

The following localities are near Perth :—

"Tree 40-50 feet, 3½ feet diameter. Bark coming off in small sheets or strips, reddish, mottled with grey, smooth. Leaves glaucous, wood hard, dark red (*sic*). Flowers apparently white; in fruit. Ironstone gravel, bed rock amphibolite. Near Greenmount, Darling Range (W. V. Fitzgerald, May, 1901). Received from Mr. Fitzgerald as *E. focunda* Schauer. "Powder-bark Wandoo." Werribee, Darling Range (Dr. F. Stoward.)

The following specimen brings the range of *E. accedens* about 200 miles north of the Perth district, and it would be desirable to look for intermediate localities.

"*Leiophloiae*. 50 feet. Dry sandy hills, Greenough and Irwin Rivers. Near *E. grossa* and *E. redunca*." (Mueller).

AFFINITIES.

1. With *E. redunca* Schauer.

Mr. Fitzgerald omitted an important character of his species, viz., the white powder of the bark, which is perpetuated in the name "Powder-bark" or "Powder-bark Wandoo." Mueller included the present species under *E. redunca* and the references,

(a) *Fragm.* xi, 15 "Cortex laevis, tactu extus albescit." (Bark smooth, externally whitish to the touch).

(b) . . . "bark, which on friction imparts a white colour, and is not shining." (Mueller, "Forest Resources of W.A.," p. 7).

(c) "Bark. . . remarkable from the white coloration which it gives off from its surface on friction." ("Eucalyptographia," under *E. redunca*).

All refer to *E. accedens*.

The new plant differs from *E. redunca* Schauer, in the bark, the not flattened fewer-flowered peduncles, broader calyx-tube, the short semi-globular lid, and in the fruits. (Original description).

Mueller, indeed, thought it to be a variety of *E. redunca* :—

On the summit of Mount Bakewell the author obtained what appears to be a large flowered variety (of *E. redunca*) with blunt and proportionately short lid." ("Eucalyptographia," under *E. redunca*).

I asked Mr. Sargent, who knows Mt. Bakewell so well, to contrast the two species, and this is what he said.

"I can never feel quite sure whether a tree is *E. redunca* or *E. accedens* without careful examination. Colour of bark, spottiness and general habit are closely alike. I think the bark of *accedens* is more opaque or less shiny than that of *redunca*, and on close examination the thick layer of white powder on the surface of the bark of the former is very characteristic. It rubs off on the slightest touch." (O. H. Sargent).

The timber dries deep reddish brown. "It is not considered nearly as good as that of the true White Gum or Wandoo, although it is like it in appearance. True Wandoo (*E. redunca*) is almost impervious to white ants or termites, whereas Powder-bark timber is frequently attacked by these insects. The base of the trunk commonly swells, and forms another characteristic of this tree. (The true Wandoo swells out like this also. J.H.M.).

"The bloom differs also from the White Gum, as also does the blossoming period. Powder-bark blooms about the same time as Red Gum, *E. calophylla*, that is, from February to April, being in full bloom in March, and it produces about the best honey of all the (W.A.) gum trees. The buds form 10 to 12 months before blooming,

that is to say, the buds which form at the end of one summer bloom during the next. (Nothing, however, is said as to the way in which the White Gum, *E. redunca*, bloom differs from that of the Powder-bark, *E. accedens*. J.H.M.).

“ Powder-bark grows on the barren, gravelly, dry hill-tops.” (*E. redunca* usually grows on flats, or at all events not on hill-tops. J.H.M.) (Mr. A. H. Smith, Apiarist, of Baker’s Hill, near Clackline, to Mr. W. C. Grasby).

2. With *E. foecunda* Schauer.

“ . . . from *E. foecunda*, Schauer, in the shape of the leaves, the anthers not being ovate, ovary not flat-topped, in the comparatively broader fruits, and the broader obtusely-pointed valves.” (Original description.) Additional evidence that the two species may resemble each other is found in the fact that Mr. Fitzgerald sent me the species he later described as *E. accedens* as *E. foecunda* from the Darling Range (Perth district).

The two species are sharply separated by the rough bark and brown timber of *E. foecunda* and the smooth bark and red timber of *E. accedens*. (See also Plates 21 to 23, Part IV, for *E. foecunda*.)

3. With *E. incrassata* Labill.

In Part IV of the present work, at p. 98, with drawings at Plate 21, we have varieties *punctulata* Benth. and (?) *rhodophloia* Benth., of *E. dumosa* A. Cunn. (Whether *E. dumosa* is a variety of *E. incrassata* or not, I will discuss in a subsequent Part.) These varieties are very imperfectly known, and I invite attention to them, in order that, if full material becomes available, we may be able to define their affinity to *E. accedens*.

DESCRIPTION.

CLXXIV. *E. cornuta* Labill.,

Voy. i, 403, t. 20 (1799).

THIS is the Voyage in search of La Perouse, and the full title is given in my paper in *Proc. Roy. Soc., N.S.W.* xliv, 127 (1910).

There is an English translation in "Voyage in search of La Perouse . . . during the years 1791, 1792, 1793, and 1794," by M. Labillardière. Translated from the French. London (John Stockdale, Piccadilly), 1800. At p. 263 we have

I gathered a new species of very tall (saillante) *Eucalyptus*, of which the following is a description :—

The most elevated twigs of that shrub are not above 13 feet in height. They are smooth, are furnished, chiefly towards the extremity, with leaves, alternate, oval, elongated, slightly bent, and about 4 inches in length.

The flowers are sessile, and generally eight or ten in number, at the extremity of a common peduncle, about an inch and one-fifth (3 cm.) in length, having all the characters of the genus *Eucalyptus*. Their stamina (stamens), which are very numerous, have long filaments of a yellow (fawn) colour. The style projects a little over the stamina (stamens).

The calyx is very much elongated, and is pushed outwards by the stamina (stamens), in proportion as they are developed, and it falls when they have acquired their full growth.

The capsule is open at top, and furnished with three cells and sometimes four. It is surmounted by a small portion of the base of the style, which is divided into as many parts as there are cells.

Every cell contains a great number of angular seeds. The form of the calyx (operculum) has induced me to give it the name of the *Eucalyptus cornuta*.

There is a brief Latin description in the same author's *Plantarum Specimen*, ii, 121 (1804-6). A similarly brief description by Schauer will be found in Lehmann's *Plantae Preissianae*, i, 127, in which the species is recorded from Cape Riche, with Herb. Preiss, No. 238.

It is described by Bentham in B. Fl. iii, 234, and figured by Mueller in "Eucalyptographia."

Veit . . . a species of the extensive Eucalyptus family, with a dark, rough, netted bark, and is always welcomed by the traveller, as growing in good soil, and amongst grass. (Surveyor General J. S. Roc in Hooker's *Journ. Bot.* vi, 45 (1854).

The bark of the upper part of the stem is often smooth and pale from lamellar secedence, but on the lower portion of the stem and occasionally even highly upwards it is dark and rugged from complete persistency, becoming sometimes as rough as that of the Ironbark trees. . . . It is one of those species which bears flowers and fruit while still a shrub ("Eucalyptographia.")

"The Yate" as a young tree is a Grey Gum, *i.e.*, with bark not so smooth as a White Gum.

A tree of medium size, is spreading in habit, and has rough, boxy, fibrous, dark bark, with vertical fissures close to each other, limbs ribbonry and smooth.

An old Yate is a large tree, and is something like an Ironbark on the butt. Indeed, it is sometimes called an Ironbark for this reason. There is no true Ironbark in Western Australia. Beyond the butt, the first large branches have bark more flaky, while the smaller branches are smooth, or nearly so. At maturity it becomes a large spreading tree, fond of creek sides.

It is considered to be the toughest of Western Australian woods, and the honey produced by the flowers is good. (Maiden in *Journ. W.A. Nat. Hist. Soc.*, iii, Jan., 1911.)

SYNONYM.

E. macrocera Turcz.

Following is a translation of the original:—

Glabrous branched stem, branches terete, covered with bark deciduous in layers; leaves alternate, petiolate, oblong-lanceolate, narrowed at the base, retuse, ending in a rather thick mucro, opaque; flowers on a recurved and compressed peduncle, sessile in a head; heads 3-8 flowered; calyx-tube turbinate, operculum conical, corniform, smooth, the apex incurved, eight times as long as the calyx-tube, and a little broader at the base than the calyx-tube. Stamens numerous, yellow, many times longer than the calyx-tube, style of the same length as the stamens, terminating in an ovate stigma. Operculum longer than in the related *E. cornuta* (Drummond's 4th Coll. No. 68), always recurved towards the apex. Drummond's 4th Coll. No. 67. (*Bull. Soc. Nat. Mosc.* 22, pt. 2, p. 20, 1849).

Bentham (B. Fl. iii, 233) places *E. macrocera* under *E. Lehmanni*, remarking that it was "described apparently from an imperfect specimen." I have two specimens of the type before me, and I can detect no coherence of the fruits at the base. The individual fruits when picked off, as they can be separately, show scars on the top of a swollen peduncle. *E. macrocera* is therefore a synonym of *E. cornuta* and not of *E. Lehmanni*, in which the fruits are fused into a mass.

RANGE.

The Yate, a tree of moderate size, when aged rising exceptionally to 100 feet, adapted for poor soil, but preferring humid localities, occurring also on limestone ground, thriving even in the most tropical climates. . . . This tree is fit even for greatly exposed situations. (*Eucalyptographia*).

It is confined to Western Australia.

The type came from the vicinity of King George's Sound (terra Van Leuwin). Bentham gives its range as from King George's Sound eastward to Cape Riche, and coastwise northerly to the Vasse River.

Mueller ("Eucalyptographia") puts it this way: "From the vicinity of Geographe Bay eastward at least to the neighbourhood of Cape Arid, extending inland to Stirling Range."

I have examined some of Drummond's specimens. As regards Drummond's 68 (4th), the specimen in Herb. Cant. is typical *cornuta*; that in Herb. Oxon. has the fruits distinctly stalked, although the stalklets are short.

Drummond's 83 (2nd collection), 1844, also belongs to this species.

Following is the most easterly locality known to me for the species:—

"Weeping Gum." Smooth bark, with more or less dark coloured, rough bark at the butt." (Hubert P. Turnbull.) Calyces more or less fused—a form intermediate between the normal form and *E. Lehmanni*.

Specimens from Mr. Turnbull have reached me direct, and also through Mr. Grasby, with two different localities, although they may turn out to be the same. (Mr. Turnbull is now fighting for his country.) (a) Alexander River, (b) Thomas River. These small rivers are not very far apart; both are between the Duke of Orleans Bay and Cape Arid (Cape Arid is the most easterly locality for the species, according to Mueller); Thomas River is a few miles more easterly than the Alexander. Lynnburn is the name of the homestead. The locality promises to be a very interesting one for Eucalypts.

We now turn west.

On side of hill, Porongorups (J.H.M.). Mt. Barker, W.A. Oldfield, in Herb. Barbey-Boissier, Geneva. "No. 872, S.W. Bay, W.A." (Oldfield) in Herb. Cant.

"Tree up to 30 metres high, yellowish bark, foliage drooping, yellow flowers." Mt. Barker (Dr. L. Diels, No. 2329).

The following four specimens are from the immediate neighbourhood of King George's Sound:—

Lower King River, King George's Sound (J.H.M.); King George's Sound (B. T. Goadby, Nos. 301, 311); Yate, Mt. Clarence, Albany (J. Staer); "South-west Plantagenet." (Dr. E. Pritzel, No. 225).

We still go west.

"Yate." Tree of 35 feet. From top of the Granite Rock Mount (rock about 300 or 400 feet high). Kent River (S. W. Jackson). "Yate," Deep River (S. W. Jackson).

We now go north.

"Yate Gum." Wonnerup, near Busselton (Forest Ranger Donovan). "Mentioning Yate reminds me that along the road between Busselton and Wonnerup occurs a little patch of the timber. It is many long miles away from the real Yate country, and it is a mystery how it has become established. The seeds may perhaps have been carried by cockatoos, or other seed-eating birds. To those who have not the

opportunity of visiting the real Yate country the Wonnerup trees will be of interest. Yate timber is the strongest in Australia. Julius records a maximum tensile strength of $17\frac{1}{2}$ tons to the square inch, $3\frac{1}{2}$ tons less than wrought iron." (C. E. Lane-Poole, in *West Australian*, 6th February, 1917.)

Cape Naturaliste, with broadish leaves (J.H.M.). Cape Naturaliste is at the south end of Geographe Bay, and, according to the map, is the most northerly locality recorded for the species. The range of the species, both north and east, should be further inquired into.

AFFINITIES.

1. and 2. With *E. Lehmanni* Preiss. and *E. annulata* Benth.

These will be dealt with in Part XXXV.

3. With *E. occidentalis* Endl.

E. cornuta has peduncles terete or nearly so, and long pedicels, or short or absent. In *E. occidentalis* the peduncles are strap-shaped, but in some forms they may be narrow. The pedicels are very short to long. The comparisons will be further referred to under *E. occidentalis* in Part XXXVI.

DESCRIPTION.

CLXXV. *E. Websteriana* Maiden.

IN *Proc. Roy. Soc. N.S.W.*, xlix, 313 (1915).

FRUTEX 6-10 pedes altus. Folia immatura glauca, breve petiolata, fere rotundata vel apice obtusa, ad 3 cm. diametro. Folia matura petiolata, glauca utrinque aequè viridia, crassa, obovata ad fere spathulata, aliquando emarginata, margine lata et incrassata, venis non prominulis patentibus. Petioli .5-1 cm. longi. Folia 2-4 cm. longa et 1.5-2.5 cm. lata. Alabastrum gracile pedunculo 1 cm. longo, pedicellos dimidio aequilongos ferente. Cupula hemisphaerica. Operculum hemisphaerico-conoideum. Antherae in loculamentis parallelis dehiscentes, filamentis basi adherentibus, apice glandula. Fructus pedunculati, pedicellati, fere hemisphaerici, plerumque circiter 9 cm. diametro. Margo latissima plana, valvarum apicibus exsertis. Valvae plerumque 4.

Species ad *E. leptopodum* vergit sed incerte ponatur.

A shrub 6 or 10 feet high. The branchlets round and the bark deciduous.

Juvenile leaves.—Yellowish-green, slightly or wholly glaucous, shortly petiolate, nearly circular, or with a blunt apex, up to 3 cm. in diameter as seen, venation moderately prominent, spreading, the lateral veins roughly parallel, intramarginal vein scarcely evident.

Mature leaves.—Petiolate, glaucous, equally green on both sides, thick, obovate to almost spathulate, sometimes emarginate, venation hardly visible, spreading, with the intramarginal vein distinctly removed from the edge, the thickened margin remarkably broad, pale-coloured. Petioles .5 to 1 cm. Leaves 2-4 cm. long, and 1.5-2.5 cm. broad.

Flowers.—Buds on a slender peduncle of 1 cm. supporting slender pedicels of half that length. Calyx tube hemispherical, operculum hemispheric-conoid.

The anthers open widely in quite lateral parallel slits, filament attached at base, a small gland at the top. It flowered on September 16th, 1900, and was observed to flower each year during the same month.

Fruits.—Pedunculate and pedicellate, remarkably hemispherical. The fruit usually a hemisphere, with a very broad, flat rim, the tips of the valves protruding, but not greatly. Valves usually four. Most of the fruits I have seen are about .9 cm. in diameter, but I have one 1.1 cm. in diameter, with a depth similar to that of the other fruits; in consequence its appearance is more tazza-like.

RANGE.

Near Coolgardie, Western Australia, associated with *E. torquata* Luehmann. (See p. 109, vol. i, of the present work.) (Mr., now Dr., C. L. Webster.)

These two species grow on a range of hills about 100 feet high above the surrounding country. The range runs almost due east and west; the country consists mostly of iron-stained gravel and boulders lying on decomposed country rock. *E. Websteriana* occurs 4 miles east of Coolgardie, at Coolgardie (Toorak), and 10 miles west of Coolgardie, near the old Southern Cross road and railway line.

AFFINITIES.

In the present state of our knowledge this is a "strong" species, that is to say, we do not know its close relations.

1. With *E. leptopoda* Benth.

The nearest approach to the remarkable fruit of *E. Websteriana* is a Tammin, W.A., specimen of *E. leptopoda*. (See fig. 8, Plate 73, Part XVII, of this work). But the juvenile leaves of the two species are sharply different, those of *E. leptopoda* being very narrow. The mature leaves also are very different. The flowers are much more numerous in *E. leptopoda*, and the anthers are similar.

2. With *E. Oldfieldii* F.v.M.

The anthers of the two species are very similar. (See Plate 73). I do not trace any other resemblances.

3. With *E. squamosa* Deane and Maiden.

In this species the filament is attached slightly at the back but the anthers of the two species are otherwise very similar. (See Plate 73.) There is some flattening of the rim in *E. squamosa*, and the shape of the buds (without the filaments), is not dissimilar, but I do not trace other resemblances.

4. With *pyriformis* Turcz.

In this species the gland is a little more forward, otherwise the anthers of the two species are much the same. I see no other resemblance.

5. With *E. decipiens* Endl.

See Plate 63, Part XIV. There is a certain amount of similarity between the juvenile foliage of this species and the adult foliage of *E. Websteriana*. The resemblance in other respects does not appear to be close.

Explanation of Plates (140-143).

PLATE 140.

E. redunca Schauer (the typical or Marlock form.)

1. Flowering twig. Drummond's 2nd Coll., No. 84 (1843). See B. Fl. iii, 253.
- 2a. Buds; 2b, flowers and early fruits. Drummond's 2nd Coll., No. 81 (1843). See B. Fl. iii, 253.
- 3a. Juvenile leaf; 3b, mature leaf; 3c, buds; 2d, front and back view of anthers; 3e, fruits. "Black Marlock," Kalgan River, near Stirling Range, W.A. (J.H.M.).
4. Mature leaf. Kalgan Plains, W.A. (J.H.M.).
5. Fruits. Preiss's No. 232 (*Plantae Preissianae*), which is a co-type.
- 6a. Buds (9 in the head); 6b, fruits, small and nearly hemispherical. Cunderdin, W.A. (W. V. Fitzgerald).
7. Buds, with short opercula. 2-3 miles west of Ongerup, W.A. (Dr. F. Stoward).

E. redunca var. *angustifolia* Benth.

8. Twig, with buds and early fruit. Drummond's 3rd Coll., No. 67. Co-type of *E. redunca* Schauer var. *angustifolia* Benth. (see B. Fl. iii, 253).
- 9a. Twig with bud; 9b, fruits. Drummond's 5th Coll., No. 187. Co-type of *E. redunca* var. *angustifolia* Benth. (See B. Fl. ii, 253).

E. redunca var. *elata* Benth.

The "Wandoo."

- 10a. Juvenile leaves; 10b, buds; 10c, mature leaf and fruits. Kalgan Plains, W.A. (J.H.M.). The type locality for *E. redunca* var. *elata* Benth. (B. Fl. iii, 253).
11. Intermediate leaf. Mundijong to Jarrahdale, W.A. (Dr. F. Stoward).
- 12a. Mature leaf (note its large size); 12b, fruits. Kelmseott, Darling Range, near Perth, W.A. (Dr. A. Morrison).
13. Buds, near Darlington, Darling Range, W.A. (Dr. A. Morrison).
14. Fruits, valves slightly exsert. Quellington, W.A. (O. H. Sargent, No. 731).
15. Fruits, rather large. York, W.A. (O. H. Sargent, No. 638).

PLATE 141.

E. redunca Schauer var. *melanophloia* Benth.

- 1a. Mature leaf; 1b, buds (14 in head) of type of *E. redunca* var. *melanophloia* Benth. (B. Fl. iii, 253). Checanga Thicket, South Hutt, W.A. (Augustus Oldfield).
- 2a. Mature leaf, thick, venation almost invisible; 2b, mature leaf; 2c, fruits (11 in head). About 30 miles due east of Katanning, W.A. (Dr. F. Stoward).
3. Mature leaf of *E. redunca* var. *elata* Benth. York, W.A. (O. H. Sargent). This is drawn because its venation is quite as much veined as that of var. *melanophloia*, because of the venation of the leaves, sometimes goes under the synonym-name of var. *venosa*.

E. redunca Schauer var. *oxymitra* var. nov.

- 4a. Mature leaf; 4b, buds (14 in head); 4c, front and back view of anther. Broad Arrow, W.A. (R. Helms, No. 102). *The type*.
- 5a. Leaf and buds; 5b, fruits. Phillips River, W.A. (Dr. L. Diels, No. 4885). The type of *E. occidentalis* Endl. var. *oxymitra* Diels, but it is not referable to that species.
- 6a. Intermediate leaf; 6b, buds. Tenterden, W.A. (Dr. A. Morrison).

PLATE 141—*continued*.*E. accedens* W. V. Fitzgerald.

(See also Plate 142.)

- 7*a*, 7*b*. Mature leaves; 7*c*, unripe buds; 7*d*, unripe fruits. "Spotted Gum," Pingelly, W.A. (W. V. Fitzgerald). *The type*.
8. Juvenile leaf. Baker's Hill, W.A. (A. H. Smith, through W. C. Grasby).

PLATE 142.

E. accedens W. V. Fitzgerald.

(See also Plate 141.)

- 1*a*. Juvenile leaf; 1*b*, fruits. Ironstone hillock, Talbot Brook, near York, W.A. (O. H. Sargent, No. 762*b*).
- 2*a*. Mature leaf; 2*b*, buds and flower; 2*c*, front and back view of anther. Cut Hill, York, W.A. (O. H. Sargent, No. 773*a*).
3. Fruits. Greenmount, Darling Range, W.A. (W. V. Fitzgerald).

E. cornuta Labill.

(See also Plate 143.)

- 4*a*. Mature leaf (the venation incorrect); 4*b*, buds; 4*c*, calyx-tube and style; 4*d*, fruits. Facsimile of a portion of Plate 20, "Atlas du Voyage à la Recherche de la Pérouse," depicting *the type*.
5. Mature leaf of Drummond's 4th Coll., No. 68 (quoted in B. Fl. iii, 234).
6. Mature leaf of Drummond's 2nd Coll., No. 83 (quoted in B. Fl. iii, 234).
- 7*a*. Head of fruits; 7*b*, single fruit (showing that they are not always sessile). Lower King River, King George's Sound, W.A. (J.H.M.).
8. Inflorescence of Drummond's 4th Coll., No. 67, which is the type of *E. macrocera* Turez., and which is referred by Bentham (B. Fl. iii, 234) to *E. Lehmanni* Preiss, but it will be observed that the calyx-tubes are not united as in that species.

PLATE 143.

E. cornuta Labill.

(See also Plate 142.)

- 1*a*, 1*b*. Thin juvenile leaves. Lower King River, King George's Sound, W.A. (J.H.M.).
- 2*a*. Head of fruits (15); 2*b*, single fruit with short pedicel. King George's Sound (collector?). Received as *E. Lehmanni*, but it will be observed that the fruits are not sessile, neither are the calyx-tubes united.
- 3*a*. Mature leaf; 3*b*, buds and flower; (note that the opercula overlap the calyx-tubes); 3*c*, stamen with wrinkled filament; 3*d*, immature fruit, with persistent styles. This is the most slender flowering form of the species I have seen. Alexander River, east of Esperance Bay, W.A. (H. P. Turnbull, through W. C. Grasby).

E. Websteriana Maiden.

- 4*a*. Juvenile leaf; 4*b*, twig, bearing mature leaves and fruits; 4*c*, portion of a mature leaf, showing its emarginate character and thickened rim; 4*d*, bud and flowers; 4*e*, three views of anther; 4*f*, fruit (enlarged). Coolgardie, W.A. (L. C. Webster). *The type*.

The following species of *Eucalyptus* are illustrated in my "Forest Flora of New South Wales"* with larger twigs than is possible in the present work; photographs of the trees are also introduced wherever possible. Details in regard to their economic value, &c., are given at length in that work, which is a popular one. The number of the Part of the Forest Flora is given in brackets :—

<i>acacioides</i> A. Cunn. (xlviii).	<i>melanophloia</i> F.v.M. (liv).
<i>acmenioides</i> Schauer (xxxii).	<i>melliodora</i> A. Cunn. (ix).
<i>affinis</i> Deane and Maiden (lvi).	<i>microcorys</i> F.v.M. (xxxviii).
<i>amygdalina</i> Labill. (xvi).	<i>microtheca</i> F.v.M. (lii).
<i>Andrewsi</i> Maiden (xxi).	<i>numerosa</i> Maiden (xvii).
<i>Baileyana</i> F.v.M. (xxxv).	<i>obliqua</i> L'Hérit. (xxii).
<i>Baueriana</i> Schauer (lvii).	<i>ochrophloia</i> F.v.M. (l).
<i>Baueriana</i> Schauer, var. <i>conica</i> Maiden (lviii).	<i>odorata</i> Behr and Schlechtendal (xli).
<i>Behriana</i> F.v.M. (xli).	<i>oleosa</i> F.v.M. (lx).
<i>bicolor</i> A. Cunn. (xliv).	<i>paniculata</i> Sm. (viii).
<i>Boormani</i> Deane and Maiden (xlv).	<i>pilularis</i> Sm. (xxxi).
<i>Bosistoana</i> F.v.M. (xliii).	<i>piperita</i> Sm. (xxxiii).
<i>Caleyi</i> Maiden (lv).	<i>Planchoniana</i> F.v.M. (xxiv).
<i>capitellata</i> Sm. (xxviii).	<i>polyanthemos</i> Schauer (lix).
<i>Consideniana</i> Maiden (xxxvi).	<i>populifolia</i> Hook. (xlvii).
<i>coriacea</i> A. Cunn. (xv).	<i>propinqua</i> Deane and Maiden (lxi).
<i>corymbosa</i> Sm. (xii).	<i>punctata</i> DC. (x).
<i>crebra</i> F.v.M. (liii).	<i>regnans</i> F.v.M. (xviii).
<i>dives</i> Schauer (xix).	<i>resinifera</i> Sm. (iii).
<i>fruticetorum</i> F.v.M. (xlii).	<i>rostrata</i> Schlecht. (lxii).
<i>gigantea</i> Hook. f. (li).	<i>saligna</i> Sm. (iv).
<i>goniocalyx</i> F.v.M. (v).	<i>siderophloia</i> Benth. (xxxix).
<i>hæmastoma</i> Sm. (xxxvii).	<i>sideroxylon</i> A. Cunn. (xiii).
<i>hemiphloia</i> F.v.M. (vi).	<i>Sieberiana</i> F.v.M. (xxxiv).
<i>longifolia</i> Link and Otto (ii).	<i>stellulata</i> Sieb. (xiv).
<i>Luehmanniana</i> F.v.M. (xxvi).	<i>tereticornis</i> Sm. (xi).
<i>macrorrhyncha</i> F.v.M. (xxvii).	<i>virgata</i> Sieb. (xxv).
<i>maculata</i> Hook. (vii).	<i>vitrea</i> R. T. Baker (xxiii).

* Government Printer, Sydney. 4to. Price 1s. per part (10s. per 12 parts); each part containing 4 plates and other illustrations.



N. Flockton del. et lith.

EUCALYPTUS REDUNCA SCHAUER. (1-7)

EUCALYPTUS REDUNCA SCHAUER, var: ANGUSTIFOLIA BENTH. (8,9)

EUCALYPTUS REDUNCA SCHAUER, var: ELATA BENTH. (10-15) [See Plate 141.]



M. Floekfon. del. et lith.

EUCALYPTUS REDUNCA SCHAUER, var: MELANOPHLOIA BENTH. (1,2)

EUCALYPTUS REDUNCA SCHAUER, OXYMITRA var: nov: (4-6). [See Plate 140.]

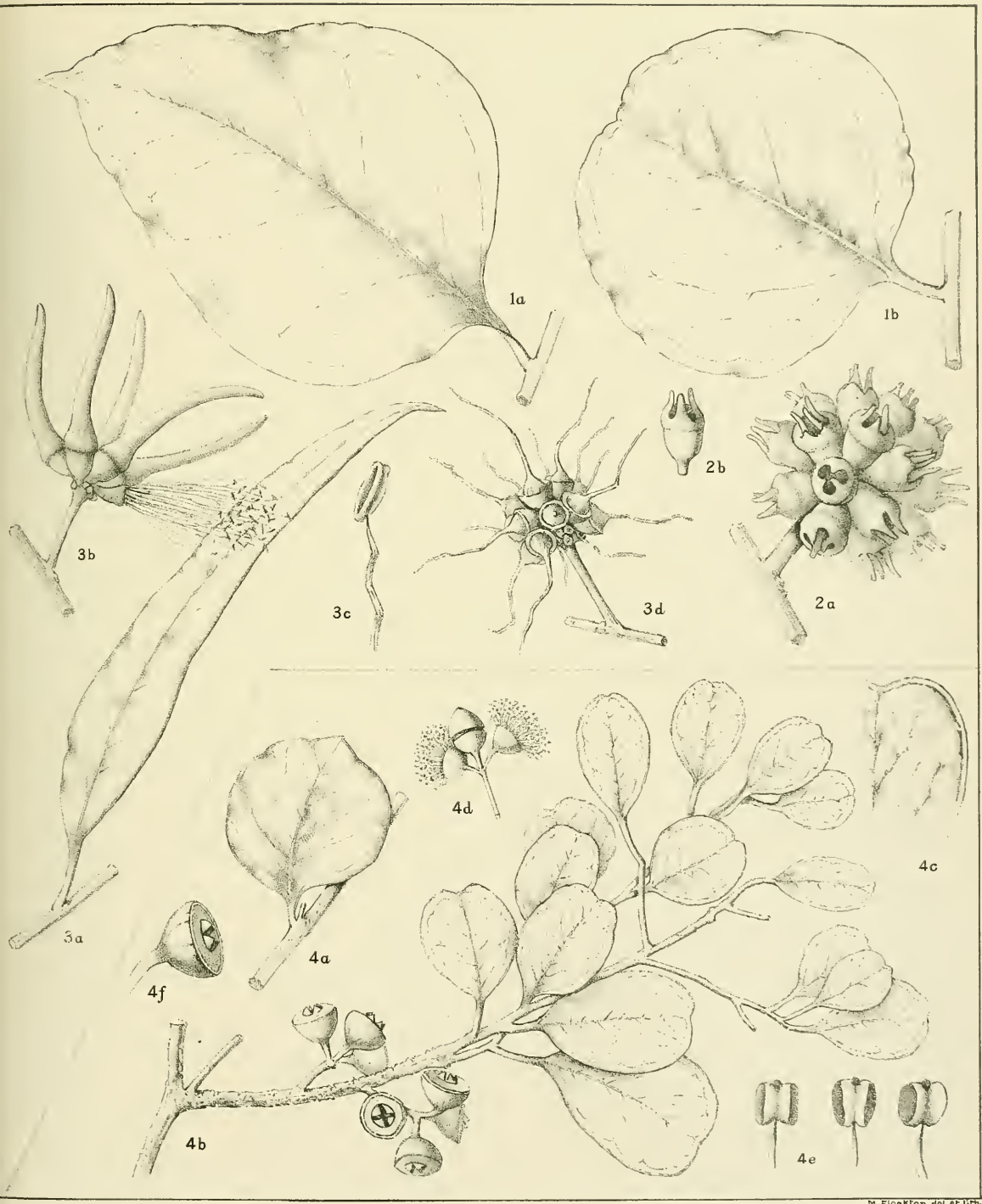
E. ACCEDENS W. V. FITZGERALD. (7,8). [See Plate 142.]



M. Flockton. del. et lith.

EUCALYPTUS ACCEDENS W. V. FITZGERALD. (1-3). [See Plate 141.]

E. CORNUTA LABILL. (4-8). [See Plate 143.]



M. Flockton del. et lith.

EUCALYPTUS CORNUTA LABILL. (1-3). [See Plate 142.]

E. WEBSTERIANA MAIDEN. (4)

DESCRIPTION.

CLXXVI. *E. Lehmanni* Preiss, Herb.,

according to Schauer in *Pl. Preiss*, i, 127 (1845).

It was, however, described as *Symphyomyrtus*, see below, where a translation is given.

Then we have Bentham's description, in B.Fl. iii, 233 :—

A tall shrub or small tree, with a roughish, reddish bark, coming off in irregular sheets. (Oldfield.)

Leaves from ovate to oblong or almost lanceolate, obtuse, under 3 inches long, very thick, the veins very oblique and rather distant, the intramarginal one at a distance from the edge.

Flowers several, often twenty or more together in dense heads upon thick recurved peduncles 1 to 3 inches long, and sometimes much flattened, the receptacle forming a globose mass of $\frac{1}{2}$ inch or more diameter, in which the calyx tubes (usually 2 to 3 lines diameter) are more or less immersed.

Operculum cylindrical, dilated at the base, obtuse, often $1\frac{1}{2}$ inches long.

Stamens $1\frac{1}{2}$ to 2 inches long, erect in the bud as in *E. cornuta*; anthers oblong, parallel-celled.

Ovary convex at the top.

Fruits half immersed in the receptacle, about $\frac{1}{2}$ inch diameter, the rim very narrow, the capsule not depressed, the exerted valves connivent into a cone, tapering into the persistent base of the style.

The juvenile leaves of *E. Lehmanni* have not hitherto been described. Those of *E. cornuta* are figured at 1a and 1b, Plate 143, Part XXXIV. Those of *E. Lehmanni* from Wilson's Inlet (Sid. W. Jackson) are petiolate, thin, small and nearly orbicular when quite young, but becoming elliptical to broadly elliptical, with a mucro, as growth proceeds. So far as specimens I have seen are concerned, the juvenile leaves of *E. cornuta* are much larger.

Bark of the trees from Wilson's Inlet is smooth, with the usual patches preparing for exfoliation, such as commonly seen in "gums."

W. Percy Wilkinson (*Proc. Roy. Soc. Vict.*, 198, 1893) has a note on the examination of oil from leaves of this species.

The handsome plate labelled *E. cornuta* in *Bot. Mag.* t. 6140 is *E. Lehmanni* Preiss, and Sir J. D. Hooker gives a useful account of it.

He adds—"The flower-heads and flowers of the cultivated plants are more than twice as large as those of any wild specimen in the (Kew) Herbarium." By that he means that those of *E. Lehmanni* are twice as large as those of *E. cornuta*.

The fusion of the buds and fruits into one head is admirably shown in the drawing. The opercula are not always as brightly coloured as was the Kew specimen. An almost similar plate, probably an adaptation, will be found as *Euc. cornuta* Labill. in "Flore des Serres," xxi, 69. Mr. D. E. Hutchins, the well-known forester, informs me that this species, which he calls the bushy Yate, is the most popular shelter-giving tree around Cape Town.

After careful thought, I think it will be convenient to keep *E. Lehmanni* as a distinct species, on the ground that, in the vast majority of cases, the calyx-tubes of *E. cornuta* are not connate into a head as in *E. Lehmanni*. I have sometimes seen them apparently fused, but the only true transit specimen I have seen is from the Alexander River (H. P. Turnbull, see Part XXXIV, p. 105), and as this specimen comes from the most easterly locality recorded (for *E. cornuta*), it would be desirable to know more about it. It may be that *E. Lehmanni* and *E. cornuta* pass into each other as we go east. At the same time Mr. Staer's *Eucla Lehmanni* specimen wants confirming, so finality is not yet reached. I have never seen in *E. cornuta* the fine scarlet colouring of the opercula as observed in *E. Lehmanni*. The head of flowers or fruits in the latter species is always larger than in the former species. Mueller says he has seen it 4 inches across in *E. Lehmanni*.

RANGE.

It is confined to Western Australia. The type came from Cape Riche (Mt. Melville).

Bentham gives it "South Coast to the east of King George's Sound; stony hills from Bald Island and Stirling Range eastward to Cape Arid."

Mr. J. Staer sent it to me labelled "*Eucla*," which is on the Australian Bight, at the junction of Western and South Australia, but I would like to be assured that this is not from a planted specimen.

Old specimens I have seen are :—

"*Eucalyptus cornuta*, Labill. N. Holland, S. Coast, Fraser, Ex herb. Lambert" in Herb. Cant. Ex herb. Lemann. This specimen was probably collected by Baxter, who collected around King George's Sound for the Sydney Botanic Gardens in Charles Fraser's time (1825).

Bald Island, W.A. (Oldfield) Herb. Barbey Boissier. Recently I got it from Dr. F. Stoward as "*Marlock*." "Height up to 30 feet and up to 12 inches in diameter. Bald and Middle Islands" (No. 115). These islands are a little east of King George's Sound.

Going a little north, we have "Shrub $\frac{3}{4}$ to $1\frac{1}{2}$ metre in height, leaves glaucous, peduncles recurved." Stirling Range in stony hills at a height of 280 metres (Dr. L. Diels, No. 2987).

West of King George's Sound, and the only specimen I have seen west, is "Tree of 35 feet, with a smooth bark. Large seed-pod like a water-can top." Wilson's Inlet (S. W. Jackson).

Mr. C. R. P. Andrews had been travelling in the King George's Sound district, thence east to Esperance, and north nearly to Kalgoorlie. In the course of a letter to me he wrote: "I saw nothing in the south that I could call *E. platypus*; the so-called 'Marlock' thickets consisted chiefly of *E. cornuta* and *E. occidentalis*. I saw *E. Lehmanni* in one place, but not in flower. I have seen it flowering in a garden in Albany with the filaments bright green."

The filaments are yellowish green in *Bot. Mag.* t. 6140, and I have seen them of that colour in a cultivated specimen. In the original they are described as dirty white (*sordide alba*). Those of *E. cornuta* are, in my experience, greenish white—that is to say, inclining to greenish, but I am not in a position to say that yellow filaments for *Lehmanni* and green ones for *cornuta* are characteristic of each species.

At Staveley, near Hamilton, Victoria, a planted tree six years old at the time was described as "12 to 20 feet high." The height was given from memory.

AFFINITY.

With *E. cornuta* Labill.

It differs in the fused calyx-tubes of *E. Lehmanni*, which form an almost globular mass. This matter has already been gone into. It may be that there is a difference in the juvenile leaves, those of *E. Lehmanni* being much the smaller, while the bark of *E. Lehmanni*, so far as we know it, is smooth, while that of *E. cornuta* is rougher. I hope that local naturalists will very carefully compare the two species.

DESCRIPTION.

CLXXVII. *E. annulata* Benth.

IN *Flora Australiensis*, Vol. iii, 234 (1866).

FOLLOWING is the original :—

A tall shrub with a smooth bark (Maxwell).

Leaves narrow-lanceolate, acuminate, mostly under 4 inches long, thick and smooth, with oblique veins usually very indistinct, the intramarginal one near the edge.

Peduncles axillary or lateral, short, thick, flat, and almost as broad as long, each with about six to twelve sessile flowers.

Calyx-tube turbinate-campanulate, about 3 lines diameter.

Operculum 6 to 8 lines long, usually incurved and very obtuse or almost clavate at the end.

Stamens straight as in *E. cornuta*, but apparently of a yellowish-white colour as in *E. macrandra*, the margin of the disc that bears them forming a raised inflexed ring about $\frac{3}{4}$ line broad.

Anthers oblong with parallel cells.

Ovary conical at the top, tapering into the style.

Fruit depressed-globose, 4 to 5 lines diameter, the convex rim protruding into a thick ring, quite distinct from the valves which project much, tapering into long erect or connivent points formed by the persistent base of the style.

There is a difference of opinion as to whether *E. annulata* should rank as a distinct species, or whether *E. cornuta* should include it and *E. Lehmanni*. I have already referred to the matter under *E. Lehmanni*, p. 113.

"*E. annulata* must be regarded as an aberrant form of *E. cornuta*, without claims for genuine specific limitation; the flower-stalks are, however, remarkably abbreviated, the calyces and therefore also the stamens are considerably reduced in length, the filaments are paler (? J.H.M.), and the stamiferous disc is singularly raised; the last mentioned note proves, however, not to be of specific avail for several other Eucalypts." (Eucalyptographia.)

The characters of *E. annulata* are :—

Leaves narrow-lanceolate, juvenile leaves unknown.

Operculum swollen at the top.

Peduncles very short, broad and flat.

Flowers and fruit sessile.

Ovary and capsule with a conical top, surrounded by a free annular disc.

Valves, when open, prominent and acuminate.

Until more is known about the species, which will include collection of complete material, I concur with Bentham in looking upon *E. annulata* as a distinct species.

RANGE.

It is confined to Western Australia. Bentham only knew it from the Salt River (Maxwell). Then we have—

“Shrub or tree of 2 to 10 metres high, bark yellowish, flowers yellowish-white.” Phillips River. (Dr. L. Diels, No. 4869).

Here is a translation of Diels and Pritzel’s remarks :—

“*E. annulata* extends for a long distance towards the east. We have observed trees 2–10 metres high, with ash-coloured smooth bark, shining leaves, showy with yellowish white flowers, in the Eyre district, near Phillips River, in Eucalyptus scrubs in muddy sandy ground (No. D4869). A typical form of this species was observed in the Coolgardie district at Grasspatch, towards the south, in small open woods (D 5284).” *Engler’s Jahrb.*, xxxv, 441, 1905.

A Mallee, 8 to 12 feet. Filaments cream-coloured and rather rigid. On sandy soil, say 20 miles south-east of Growangerup, 20 miles north of Stirling Range (W. C. Grasby).

“Shrub ranging from 7–8 feet. On cleared land on which the plant had apparently re-established itself. Main road near road-side, elevated sand-plain, 2 miles west of Ongerup” (Dr. F. Stoward, No. 128).

We therefore have the range, so far as ascertained at present, from the vicinity of the Stirling Range, making north-easterly to Grasspatch, between Esperance and Norseman, taking the Salt and Phillips Rivers on the way.

AFFINITY.

With *E. cornuta* Labill.

Compare Plate 145 with Plates 142 and 143 of Part XXXIV. The juvenile foliage of *E. annulata* is unknown. The opercula of *E. annulata* are shorter, less curved, and dilated at the summit. The peduncle of *E. annulata* is short and broad-flattened; that of *E. cornuta* is long, slender and rounded, and is rarely broadish. The fruits are very different, the valves in *E. annulata* being shorter, broader, and with less tendency to approximation at their tips.

DESCRIPTION.

CLXXVIII. E. platypus Hooker.

IN Hooker's *Icones*, t. 849 (1852).

FOLLOWING is a translation of the original :—

Very glabrous, branches terete.

Leaves alternate, obcordate, thickly coriaceous, rigid, shiny, imperforate, subsinuate, narrowed into a short, somewhat twisted petiole.

Peduncle axillary, of the length of the leaves, flattened and two-edged, very broad, woody, coriaceous, three to five flowered at the apex.

Operculum cylindrico-conical, elongated-obtuse.

Calyx turbinate.

Stamens numerous, sulphur coloured, longer than the calyx.

The remainder of the description is in English, as follows :—

Hab. South-Western Australia, near King George's Sound, Drummond (No. 183).

A very remarkable species of *Eucalyptus*, easily distinguished in this extensive and difficult genus. *Euc. Preissiana* Schauer has a similar broad and ancipitate peduncle, but that is placed in the division *Oppositifoliae*, and has the leaves opposite or subalternate, elliptical, oblong or subparabolic, pellucidopunctate, the base rounded, and the petiole as long as the peduncle—characters much at variance with our plant.

Bentham's description follows :—

A tree attaining 30 feet, with a smooth bark (Maxwell).

Leaves very broadly ovate or orbicular, often coarsely crenate, mostly under 2 inches long, very thick, smooth and shining, the oblique veins scarcely visible.

Peduncles axillary, thick and hard but flat, and often $\frac{1}{4}$ to $\frac{1}{2}$ in. broad, erect or recurved, mostly above 1 in. long, each bearing about three to seven flowers.

Calyx-tube usually 3 to 4 lines long, thick, but narrow-turbinate, smooth and nearly terete, or with two, three, or sometimes four more or less prominent ribs or angles, and generally tapering into a very short, thick, angular or flattened pedicel.

Operculum tapering upwards, longer and oftener narrower than the calyx-tube.

Stamens erect in the bud as in *E. cornuta*, the outer ones attaining 7 to 8 lines; anthers ovate-oblong, with parallel cells opening longitudinally.

Ovary conical in the centre, with as many raised lines as cells.

Fruit obovoid-truncate or turbinate, $\frac{1}{2}$ to nearly $\frac{3}{4}$ inch long and 4 to 7 lines diameter, slightly contracted at the orifice, the rim rather broad, convex; the capsule somewhat sunk, but the valves often acuminate by the split base of the style, with the points protruding.

The species usually forms gregarious small trees, erect in habit, with smooth bark, a little ribbony at butt.

Timber with a faint blush of pink when quite fresh, drying to pale-coloured and tough.

Egg-in-eggcup buds. Fruits more angled in some than others.

Some of the plants in exposed positions at Hopetoun have fruits nearly as dipterous as those of *E. diptera* Andrews.

The figure on the right-hand top corner of the "Eucalyptographia" plate of *Eucalyptus obcordata* is nearly the type of the present species.

"Forming dense impenetrable thickets," 'Maalok' of the natives, *Maxwell* (quoted by Bentham).

Mueller (Eucalyptographia) says: "This is the 'Maalok' of the aborigines, who must have bestowed that particular designation on this Eucalypt for some obvious reason" This is, however, only partly true, because the term "Maalok" is applied to a number of species in Western Australia. The word "Maalok" (it might just as well be written "Marlock") is not specific. It means a thicket, and is used in much the same sense as Mallee is used in the eastern States. There are various qualifying adjectives, such as Black, White, &c.

Dr. A. Morrison, then Government Botanist of Western Australia, wrote to me in 1909: "The word 'Maalok' has always appeared to me to be the equivalent of the eastern 'Mallee'; but however that may be, I have been informed by a surveyor (Mr. F. M. Bee), who was at work in the southern part of the State, that it means literally 'thicket.' It seems to be applied to any stunted bushes on the sand plains by white men." He also pointed out that the depauperate form of what is normally a large tree (e.g., *E. calophylla*) may be called by bushmen "Marlock." The aboriginal name for this species, which appears to be exclusive, is "Moort."

SYNONYM.

E. obcordata Turcz., in *Bull. Phys. Math. Acad. Petersb.*, 10, 1852, p. 337.

"47. *Eucalyptus obcordata* (Drum, 5, n. 183).

"E. glabra; ramis teretibus; foliis alternis obcordato-rotundis, prope emarginaturam interdum utrinque crenulis 1-2 munitis, aut repandis, crassis obscure 5-nerviis, basi in petiolum attenuatis; umbellis lateralibus 2-5 floris; pedunculis alato-compressis petiolo multoties longioribus; cupulis obconico-pyramidatis tetragonis sessilibus operculo conico-cylindraco recto subduplo brevioribus. Species foliorum forma distinctissima! Pedunculus apice in receptaculum margine dentatum dilatatus. Operculum unicum tantum vidi. Capsula inclusa, vertice plano. Stylus basi incrassatus, tetragonus. Filamenta lutea, cupulam duplo excedentia."

The original is difficult to obtain, so I give it, and also a translation :—

"Drummond's 5th collection, No. 183.

"Glabrous, branches smooth, leaves alternate, obcordate-rotund, sometimes furnished with one or two crenulae at each side near the top, or repand (where there are on the margin small sinuses, and between them segments of a small circle.—J.H.M.), thick, indistinctly 5-nerved, narrowed at the base into a petiole; umbels lateral, 2-5 flowered; peduncles winged-compressed, many times longer than the petiole; calyx-tubes obconical-pyramidal, tetragonal, sessile, about twice as short as the straight conical-cylindrical operculum. The leaves of very distinct shape! Peduncle dilated at the apex into a receptacle, toothed at the margin. Operculum unique as far as I have seen. Capsule included, with a smooth top. Style thickened at the base, tetragonous. Filaments pale yellow, twice as long as the calyx-tube."

Mueller ("Eucalyptographia") says that the names *platypus* Hooker, and *obcordata* Turcz., "arose simultaneously." He goes on to say: "I have preferred Turczaninow's appellation, as Hooker's clashed to some extent with that of *E. platypodos* of Cavanilles, and is applicable to many species, although, &c." This is an excellent example of the soundness of the dictum that while it may be wise to take a certain action, it may be the reverse of wise to give reasons.

The late J. G. Luehmann (*Proc. Aust. Assoc. Adv. Science*, 1898), under the heading of *E. platypus*, says that Mueller "adopted in Eucalyptographia *E. obcordata* Turcz., which appellation appears to me quite misleading and has no claim to priority."

VARIETY *nutans* Benth.

Flowers and fruits larger, the ribs more prominent, one or two sometimes expanded into thick wings—*E. nutans*, F. Muell. *Fragm.* iii, 152. In the interior from Bremer's Inlet, forming dense thickets, *Maxwell.* (B.Fl. iii, 235).

Following is translation of the original description of *E. nutans* F.v.M. :—

A tree, branchlets strong, tetragonous-compressed at the ends.

Leaves thick, coriaceous, sub-rotund, alternate, with long or rather short petioles, the same colour on both sides, shining, covered with pellucid dots, irregularly and finely penniveined, the peripheral vein distant from the margin.

Peduncles long, recurved, broadly flattened, at first canaliculate, 3-7 flowered.

Pedicels short or obliterated.

Calyx-tube with four large ribs, twice as broad as the terete-conical operculum, and barely equal to it in length.

Filaments red, almost ellipsoid.

Fruit semi-ovate, 5-6 celled, two of the ribs dilated into a keel.

Valves acuminate, touching the orifice.

Seeds wingless, the fertile ones faintly clathrate.

On the eastern shores of Bremer Bay, forming dense woods. (Maxwell.)

A tree reaching 30 feet in height.

Leaves 1-2 inches long and broad, margin very often bent back, emarginate or obtuse at the base, sometimes apiculate.

Peduncles 1-1½ inches long, a little broader above, 4-6 lines broad, slightly arched at the base with twoymbiform-oblong bracts measuring 2 lines long and soon deciduous.

Flowers nodding.

Calyx with its ribs tapering into a strong pedicel.

Operculum about half an inch, ecostate, somewhat obtuse.

Filaments exceeding half an inch or longer.

Anthers $\frac{3}{4}$ line long, yellowish-white.

Style scarcely equalling the stamens.

Stigma dilated.

Fruit half an inch or a little longer, nodding, with two rather narrow ribs.

Sterile seeds varying in form; the fertile ones about half a line long, black, ovate-rotund.

E. platypus Hook. Ic. 849, is similar to our species in leaves, the breadth of the peduncles, and the opercula, differing entirely, however, in the not very deeply-ribbed calyx and the fruits.

It will be observed that the type of the variety came from Bremer Bay. I collected tall shrubs or small trees, or thin shrubs of 6-8 feet growing in small masses, but not a true mallee; broadly lanceolate leaves; very pendent flowers; short opercula, crimson filaments, which well contrast with the yellow anthers, at Kundip, 20 miles north of Hoptoun, near Ravensthorpe.

RANGE.

A Western Australian species. The type is from near King George's Sound.

Bentham says "From about 6 miles north of the west end of Stirling Range, extending far away eastward towards Phillips Ranges."

Mueller adds ("Eucalyptographia") "and to near Bremer's Inlet."

It occurs from the vicinity and north of the Stirling Range, thence south along the coast as far as Esperance, then striking inland to the Phillips Ranges, and as far to the north-east as 140 miles east of Kalgoorlie. In the extensive wedge-shaped piece of country thus defined, the species remains to be recorded from many localities.

Note by Surveyor-General T. S. Roe on specimen in the Vienna Herbarium. "Almost impenetrable thickets, 10 to 20 feet in height, 60 miles northward from King George's Sound, Western Australia."

Drummond's 183 (5th) came from Swan River to Cape Riche (Herb. Oxon. and Cant.). This is the type.

Note on specimen of Maxwell's. "Western Australian Mallee, commences about 6 miles north from the west end of the Stirling Ranges and extending far away to the eastward, past the Phillips Ranges."

Following are some recent specimens:—

"Tree of 20 feet. Broad leaves." (T. Carter, Broome Hill, per O. H. Sargent.)

"Moorett" (apparently an attempt to spell Moort). "Trees always with round leaves like this. A scrub tree like a Mallee. 1 foot through and smaller, with very long branches." Stirling Range (Louis Dillon, per A. Murphy).

"Round-leaf Moort." "Tree of 20-30 feet and 6-12 inches diameter. Filaments greenish-yellow." Near Growangerup Railway Station, east of Tambellup (Dr. F. Stoward, No. 95). Dr. Stoward says it grows in the eastern district, east of Katanning and Tambellup, and that the bark is commercially valuable for tanning purposes.

"Round-leaf Moort." Township of Growangerup (Dr. F. Stoward, No. 124).

"Round-leaf Moort." "Bottom of slope, damp land, off roadside, main road near and east of Growangerup. Tree 15-20 feet and over, forming dense forests in the locality." (Dr. F. Stoward, No. 129.)

"Moort." Growangerup, east of Broome Hill (W. C. Grasby).

"Round-leaf Moort." "Dense sapling-like growths almost exclusively of this tree occupy light sandy stretches, the upper layers of which contain much organic matter and are almost black in colour. This species appears to be confined to gentle depressions where natural drainage occurs, and are frequently very moist during the wet period of the year; 4-5 miles west of Ongerup, off main road; 10-15 feet or more in height, branches only at top, main stem 3-4 inches in diameter." (Dr. F. Stoward, No. 130.)

It is known as "Laurel Gum." Smooth bark, grey streaks, thick round leaf. About 20 feet high. Largest about 14 inches through. Usually in dense thickets. "'Moort' of the aborigines." (F. M. Bee, near West Mt. Barren, correspondent of Dr. A. Morrison.)

It is abundant at Hopetoun, 170 miles east of Albany, where it is the commonest Eucalypt near the beach, forming dense masses (thickets) up to 30 feet in height and with a trunk diameter of 4 inches to a foot. (J.H.M.)

A SUPPOSED VARIETY.

Now we come to consideration of a supposed variety.

"In R. Brown's collections are some specimens in very young bud and fruit from Goose Island Bay, apparently of a variety of this species, with leaves from ovate to ovate-lanceolate, but obtuse and under 2 inches long, as in the broad-leaved form. I have not seen the stamens." (B. Fl. iii, 235.)

Goose Island Bay is Robert Brown's Bay ii and is in the D'Entrecasteaux Archipelago (say Lat. 34° S.; long. 122° 23' E.) near Esperance. (See my "Sir Joseph Banks," p. 107.)

These may be compared with the Hopetoun specimens, from no great distance. I have there collected specimens quite typical, and, amongst them, leaves varying from lanceolate to broadly lanceolate. I do not think that we have here even a variety.

In *Proc. Roy. Soc. S.A.*, XVI, 358. Mueller and Tate, in describing the Elder Expedition specimens, record *E. obcordata* (*platypus*) as collected by R. Helms on 5th November, 1891. 40 miles north-west from Fraser Range, W.A.

As mentioned by me in Part XVI, p. 204 of this work, the specimens are referable to the species afterwards named *E. Campaspe* Moore.

A FORM ALLIED TO *E. spathulata* Hook.

We now arrive at consideration of certain specimens which (in the present unsatisfactory state of our knowledge of *E. spathulata*) had better be placed in a suspense account.

1. "A dense scrubby growth 4-6 feet high (Marlock), with conoid, angular fruits, flattened foot-stalks, buds egg-in-egg-cup, and narrow or spathulate leaves.

"The second growth foliage is very much more spathulate than shown by Hooker, *Icones*, 611 (type of *E. spathulata*). I, however, picked from the same clump of shrubs specimens precisely similar to those in Hooker's figure, and also some strictly spathulate, 5 cm. long and rather more than 2 broad. They are all thick and coriaceous, and the venation appears to be not dissimilar to that of *E. occidentalis*.

"It is rather common near the Kalgan River (Porongorups to Stirling Range)." This is an extract from the *Journ. W.A. Nat. Hist. Soc.* iii (Jan., 1911), describing a form I had suggested to be a var. *spathulata* of *E. occidentalis*.

2. "Locally called a 'Moort.' Dense sapling-like trees, 10-20 feet, main stem 2-3 inches or more in diameter. Growing in flat depressions, moist in wet season. Trees branch only at their tops and form such dense growth that other plant species are excluded." Near Ongerup (Dr. F. Stoward, Nos. 131 and 133).

Nos. 1 and 2 appear to be alike, and are figured at figs. 2 and 3, Plate 146.

It is found that the leaves vary a good deal in width. They are thick and shiny and in those respects, and because some of the leaves are getting broad, I think that, when we know more about these shrubs, we will pronounce them to constitute a form of *E. platypus*, showing transition to *E. spathulata*, through the broader leaved forms of that species.

AFFINITIES.

1. With *E. cornuta* Labill.

"From *E. cornuta* it differs chiefly, besides in foliage also in lesser height, in the broader and longer flower stalks, generally shorter lids, colour of filaments, very angular fruits and short valves; but a variety is depicted in the plate of *E. obcordata* (*platypus*), which approaches in the form of the calyces rather closely *E. cornuta*." ("Eucalyptographia," under *E. obcordata*.) Compare plates 142 and 143 with plate 145.

E. platypus has more of a Mallee habit, while *E. cornuta* is less gregarious and more umbrageous, with timber especially esteemed. The juvenile leaves of *E. platypus* are more fleshy, those of *E. cornuta* being thin. The diameters of the calyx-tubes as compared with those of the opercula, are very much more accentuated in *E. platypus*, while in that species they are relatively shorter and less curved. The fruits of *E. platypus* lack the drawn out capsule valves which are so obvious in *E. cornuta*.

2. With *E. occidentalis* Endl.

The relations between these two species are very close, and it will be best to consider them when *E. occidentalis* is reached in Part XXXVI.

DESCRIPTION.

CLXXIX. *E. spathulata* Hook.*Icones Plantarum* t. 611 (1852).

FOLLOWING is a translation :—

Operculum cylindrical, obtuse, three times longer than the turbinate ovary, leaves linear-spathulate, somewhat acute, with little dots, peduncles short, broad, compressed, 3-5 flowered, flowers shortly pedicellate.

Hab. Swan River. James Drummond. (Suppl. Coll., No. 20).

Shrub entirely glabrous. Branches terete, brownish, branchlets angular.

Leaves opposite, 2 or 3 inches long, linear-lanceolate, obtuse, attenuate at the base, green, faintly one nerved, on both sides faintly punctate under the lens.

Peduncles solitary, axillary, half an inch long, dilated, compressed, umbellate at the apex, 3-5 flowered.

Flowers shortly pedicellate, pedicels thickened, dilated gradually into a turbinate, truncate, intensely brown ovary.

Operculum when dry, pale brown, cylindrical, obtuse, 3 times longer than the ovary, stamens numerous, erect at first, afterwards spreading.

Filaments somewhat thickened, yellowish, anthers small, style straight, of the length of the stamens.

Stigma simple.

What follows is in English :—

A species of *Eucalyptus*, not distributed, I believe, in the valuable sets lately sent to his subscribers from the Swan River Settlement by Mr. Drummond, but forming part of a supplementary set transmitted to the author. It is very different to any species with which I am acquainted, or can anywhere find described.

Thus Drummond's No. 20 (Suppl.) is the type.

Bentham (B. Fl. iii, 236) gives a description in English and attributes Drummond's 3rd Coll., No. 68 to the species.

It is not very well named, the leaves being only exceptionally and very slightly spathulate. We require juvenile leaves and ripe fruit to satisfactorily understand this species. We know nothing of its habit or size, nor indeed of its precise range.

Bentham (B. Fl. iii, 236) describes it in the following words :—

A shrub of 6 to 8 feet or rather more.

Leaves linear, linear-lanceolate or rarely oblong-lanceolate, straight or slightly falcate, under 3 inches long, thick, and rigid so as wholly to conceal the veins.

Peduncles short, axillary or lateral, flattened but usually not very broad, each with about 4 to 6 flowers.

Calyx-tube obovoid, thick, about 2 lines long, tapering into a short thick pedicel. Operculum cylindrical, obtuse, often narrower than the calyx and about twice as long.

Stamens erect, slightly flexuose, about 4 lines long, the border of the staminal disc inflected over the sunk ovary; anthers oblong, parallel-celled.

Style slightly thickened at the base.

Fruit obovoid, 3 lines or rather more in length, and nearly as much in diameter, contracted at the orifice, which is further closed by the rather broad, flat rim; capsule sunk, but the points of the valves sometimes slightly protruding.

RANGE.

It is confined to Western Australia. Drummond collected the type.

Bentham quotes Harvey as having got it "between Perth and King George's Sound."

I have seen the following specimens :—

No. 58, Drummond; No. 68, Drummond, quoted by Bentham as belonging to this species. I have a specimen of the latter, and also a drawing of No. 58. The leaves are covered with fine dots. No fruits.

The following specimen in bud (the operculum pale or chestnut coloured) and mature leaves, was sent to me by Dr. F. Stoward under No. 93. "Local name Swamp Mallet. Tree from 20 to 30 feet and up to 2 feet in diameter. Grows generally around lakes in Southern District, east and west of Katanning. Bark of tree is used for tanning purposes, but is not favoured by merchants. Bark is thin but contains a lot of tannin. Lake Ewlymartyup, east of Katanning." The material available is figured at fig. 7, Plate 146, and pending complete specimens seems nearest to *E. spathulata*. Venation hardly visible, leaves very black, dotted. I note that it is a tree; I personally only know *E. spathulata* as a shrub.

The following specimens seem to belong to *E. spathulata* :—

"Shrub 1-1 $\frac{3}{4}$ metres high, purplish operculum." Facup Creek, Kent district (Dr. L. Diels, No. 4767). Leaves a little broader than the type. Calyx-tubes very angled; fruit conoid and tips of valves protruding. Broome Hill (Dr. A. Morrison). Leaves a little broader than the type, fruits quite smooth, tips of valves not protruding.

Cunderdin (W. V. Fitzgerald, Nov., 1907). (Received as *E. leptopoda* Benth.). The leaves are broader than the type, the fruits smooth, rather pear-shaped, or even tending to globose, the pedicels slender, the rims horizontal. They have a Brachyscelid gall shaped like a young pomegranate.

Variety *grandiflora* Benth.

Leaves rather broader. Flowers and fruits larger. Phillips Range, *Maxwell*. (B. Fl. iii, 236).

Shrubs on dry gravelly places. Phillips Range (*Maxwell*).

The material available is figured at fig. 1, Plate 147.

It will be seen that, if referable to *E. spathulata* (and, in its incomplete state it is as near to that species as any other), it seems, in the fruit, to have affinity with *E. occidentalis*, var. *cremophila*.

AFFINITIES.

1. With *E. platypus* Hook.

Under *E. platypus*, p. 123, I have already discussed some specimens which seem to show transit between *E. spathulata* and *E. platypus*, but we are hampered by the imperfection of our knowledge in regard to the former species.

2. With *E. occidentalis* Endl.

"*E. spathulata* Hook., is an extreme form of *E. occidentalis*, distinguished chiefly by small flowers and short and extremely narrow leaves. *E. spathulata* Hook. f. and *E. macrandra* F.v.M. are probably extreme forms of this species" (*Eucalyptographia* under *E. occidentalis*).

J. G. Luehmann was of opinion (*Proc. Aust. Assoc. Adv. Science*, 1898) that *E. occidentalis* included *E. macrandra* and *E. spathulata* as varieties, but did not give them names.

In B. Fl. iii, 195, Bentham makes a statement of the points of *E. spathulata* for comparative purposes, as follows:—

Leaves narrow.

Peduncles flat.

Flowers and fruit shortly pedicellate.

Ovary flat-topped, the style not thickened.

Fruit obovoid, much contracted at the orifice.

Points of the valves often protruding.

I have not seen the ripe fruit of the type, and further consideration of the affinities of the two species may be considered until *E. occidentalis* is reached.

3. With *E. redunca* Schauer (especially var. *angustifolia*).

"This species has much of the aspect of the narrow-leaved forms of *E. redunca*, but in that the operculum is acuminate, and the stamens more or less inflected in the bud." (B. Fl. iii. 236).

Compare plates 140, 141 (Part XXIV) *E. redunca*, with Plate 146, *E. spathulata*.

The juvenile leaves of *E. redunca* are broad, while it can be very safely predicted that those of *E. spathulata* are narrow. The opercula of the latter are blunt.

I have not seen the fruits of typical *E. spathulata*, but Bentham says they are much contracted at the orifice, as indeed those of *E. redunca* are.

4. With *E. salubris* F.v.M.

There may perhaps be a word of caution that some specimens of *E. spathulata* may superficially resemble some of *E. salubris*. *E. salubris* has not yet been figured for this work.

DESCRIPTION.

CLXXX. *E. gamophylla* F.V.M.

IN *Fragm.* xi, 40 (1878).

FOLLOWING is a translation of the original :—

Hoary glaucous, branchlets not angled.

Leaves opposite, equilateral, entirely connate below, lanceolate above, broader below, spreadingly penniveined, reticulate-veined, peripheral vein irregularly distant from the margin.

Peduncles very short, thin, terete, two or three flowered, here and there one-flowered, pedicel very short.

Fruit rather long, cylindrical hemi-ellipsoid, exangular, valves three, more rarely four, almost deltoid, inserted near the very narrow orifice, the fertile wingless seeds many times exceeding in size the sterile ones.

On Mount Pyrton in the Hammersley Range at a height of 2,500 feet. (J. Forrest).

I know nothing of its habit.

Leaves 2-2½ inches long, those below ¾-1 inch broad, somewhat rigid, of the same colour on both sides.

Flowers axillary except at the ends of the branches.

Stamens and style unknown.

Fruits almost half an inch long. Fertile seeds about 1½ lines long, acute angled, compressed, bearing a very narrow membrane not quite encircling it. (See also notes below under *E. perfoliata* and *E. pruinosa*.)

A specimen from the Elder Exploring Expedition, Fig. 3. Plate 147, named by Mueller, has flowers in five and more, and is not "two or three flowered" as in the original description. The anthers have parallel cells, and the style has no expanded stigma, and is rather short, that is to say, it does not reach above the inflected filaments. The style has a roughened or resinous appearance.

It is described in English, with a plate, in the "Eucalyptographia":—"Sometimes the whitish bloom is almost entirely wanting According to a note of Rev. H. Kempe, the leaves in aged plants are always connate into pairs, but I observed them occasionally severed to near their base, though on one side only. Occasionally leaves occur twice as large as any illustrated in our lithographic plate. Flowers and fruits are variable in size He goes on to say that the species is always a "shrub," but the missionaries on the Finke River used to employ its timber, though widths exceeding 8 inches were not obtainable.

It will be seen from the above, and also from the Eucalyptographia plate, that all the leaves known to Mueller, at least at that time, were perfoliate or connate, but, *e.g.*, figures 4b, 5, 7, Plate 147, the species may have sessile or even petiolate leaves.

RANGE.

It occurs in Western and South Australia, and the Northern Territory.

The type comes from Mount Pyrton, Western Australia.

Mueller (*Eucalyptographia*) states the range thus:—"On the Hammersley Range, ascending on Mount Pyrton (Pyrton) to a height of 2,500 feet (J. Forrest); in the Glen of Palms (E. Giles) between the Alice Spring(s) and Lady Charlotte's Water (C. Giles); (Charlotte Waters); on sand hills near the Upper Finke River and some of its tributaries, particularly Goyder's Creek (Rev. H. Kempe)."

Western Australia.—Mount Pyrton, up to an elevation of 2,500 feet, Hammersley Range, about 100 miles south west of Nickol Bay. (Plants of N.W. Australia in J. Forest's trigonometrical survey of Nickol Bay District, determined by Mueller.)

Close to this, but a very little further north, we have Fortescue River (W. H. Cusack, 1895, in *Herb.*, Melb.). In flower. Still farther north we have Harding River, which flows into Cossack Bay, near Roeburne (W. H. Cusack, 1895, No. 210 in *herb.*, Melb.). In fruit. (Seems very like *E. argillacea*).

"Western Australia" (W. Cuthbertson in *herb.*, Melb.). In early fruit, converted into comparatively large galls. Mr. Cuthbertson collected in 1888, between the Murchison and the Gascoyne, the *Acacia* that Luehmann later named after him. The *Eucalyptus* specimen was perhaps collected in the same district.

Very glaucous. Cavenagh Range, Mount Cooper, W.A. (R. Helms, Elder Exploring Expedition, 30th September, 1891). This would be Camp 65.

South Australia.—"Very glaucous. Boundary of South and Western Australia," or "S.A. near boundary of W.A.," as Tate and Mueller put it. (R. Helms, Elder Exploring Expedition, 17th July, 1891, Camp 23). See p. 54, Journal of the Expedition. Camp 23 is nearly at the foot of Mount Agnes, and a little south-east of it. It is within the South Australian border, and approximately at the junction of lat. 27° S., and long. 129° E.

Northern Territory.—The following specimens may or may not have been collected north of lat. 26° (Northern Territory boundary).

"Central Australia" (Ch. Winnecke in *Herb.*, Melb.). Hardly glaucous. Small flower-buds and flowers. This is evidently the specimen referred to by Mueller in his account of Winnecke's plants, "between lat. 22° 30' and 28° S. and long. 136° 30' and 139° 30' E., during his expedition in 1883" (*Proc. Roy. Soc., S.A.*, viii, 10). At p. 12 Mueller says: "On the specimens now collected, the upper leaves become narrow lanceolar continuing opposite or getting scattered." The specimens are hardly glaucous, and have small flower-buds and flowers.

The following specimens are indubitably within the Northern Territory.

Moderately glaucous. Between Finke River and MacDonnell Ranges (Lieut. Dittrich in Herb., Melb.). Very glaucous, juvenile leaves only, north of MacDonnell Ranges (Lieut. Dittrich, 1886, in Herb., Melb.). Very glaucous. Henbury station, Finke River, 9th March, 1911 (G. F. Hill, No. 45). Very glaucous. 35 miles north-west of Meyer's Hill, 2nd June, 1911 (G. F. Hill, No. 223).

AFFINITIES.

1. With *E. perfoliata* R. Br.

"It is distinguished from *E. perfoliata* R. Br. (B. Fl. iii, 253) by smaller leaves, calyx-tube twice as long as broad, the fruit many times smaller, not unceolate." (Original description.)

"The concrescence of the leaves by pairs in all stages of growth occurs, as far as known, only in *E. perfoliata*, if even in that rare and little known congener this coalescence should prove also unexceptional; nevertheless, it must be kept in mind that the Risdonian variety of *E. amygdalina* (*E. Risdoni* Hook. f.), and also *E. uncinata*, or a closely allied species (it is not clear what this species is—J.H.M.), when in their stage of opposite leaves, occur also with some of them occasionally quite grown together into one." (Eucalyptographia under *E. gamophylla*).

E. perfoliata R. Br. is a very coarse species, with leaves and inflorescence very much larger than those of *E. gamophylla*. The large urceolate fruit shows that the former belongs to the Corymbosae. The two species are by no means closely related.

In my paper "On two new Western Australian species of Eucalyptus," in *Journ. Nat. Hist. and Science Soc. of W.A.*, iii (1910), I have some notes on the connate and petiolate leaf. Taking the list of species therein enumerated (and *E. Perriniana* F.v.M., see Part XXVI of the present work can be added), we find that all species tend to the elimination of the connate or petiolate leaf as development proceeds.

2. With *E. pruinosa* Schau. and *E. melanophloia* F.v.M.

"The exact affinity of this species can be best shown by the stamens (not known then—J.H.M.), which will perhaps prove to be near *E. pruinosa* and *E. melanophloia*." (Original description.)

Subsequently the stamens were found, and we have :—

"In the systematic arrangement it might find its place near *E. pruinosa* and *E. melanophloia*, from both of which, irrespective of its stunted habit, it differs already in the above given notes of the union of leaf-pairs, and the size and shape of the embryonate seeds, and besides in the longitudinal dehiscence of the anthers." (Eucalyptographia under *E. gamophylla*.)

In the absence of full herbarium material, it is not always easy to distinguish *E. gamophylla* from *E. pruinosa*. Compare Part XII, Plate 52 of the present work. The former is rated as a shrub, at the same time it must be a big shrub with timber

8 inches in diameter. *E. pruinosa* is a tree, with box-like bark. The juvenile foliage of *E. pruinosa* and *E. gamophylla* are not different in size, but the leaves are not fused in the former species, nor have narrow lanceolate leaves been recorded in *E. pruinosa* so far. The anthers of the two species are different, those of *E. pruinosa* being semi-terminal and those of *E. gamophylla* with parallel cells. The branchlets are more quadrangular and the fruits of *E. pruinosa* are larger, ribbed, and with a rim.

3. With *E. melanophloia* F.v.M.

Reference may be made to Plates 53 and 54 of Part XII. Here again the pairs of juvenile leaves of *E. melanophloia* are not united. *E. melanophloia* is a medium-sized or largish tree with rough bark and red timber. The opercula are more pointed, the anthers not very different; the fruits are smaller and less elongate.

4. With *E. tetragona* F.v.M.

"Another remarkable distinctive character of *E. gamophylla* rests in the extreme difference of the fertile and sterile seeds, and this finds to some extent its repetition only in *E. tetragona*, which species shows also a form and structure of the fertile seeds similar to those of *E. gamophylla*. The best position for *E. gamophylla* would probably be near *E. tetragona*, although the stamens are not eudesmoid." (Eucalyptographia under *E. gamophylla*).

I would point out that *E. tetragona* belongs to the Eudesmieae. It has petiolate leaves, branchlets very tetragonous, and very much larger, winged fruits. At the same time the affinity of the two species as regards their seeds is obvious. At present I would say that it possesses characters between *E. melanophloia* and *E. tetragona*.

DESCRIPTION.

CLXXXI. *E. argillacea* W. V. Fitzgerald, n.sp.

THE following description is new :—

Arborescent: branchlets, leaves and inflorescence whitish or glaucous.

Leaves alternate or scattered, ovate-lanceolate to lanceolate, very obtuse or rounded at the apices or shortly apiculate, stalked, rigid, the veins numerous, very fine, not much ascending, reticulate between the intramarginal one very adjacent to the edge.

Flowers pedicellate, in umbels of 4-6, usually several together, forming axillary or terminal panicles.

Peduncles erect, terete, slender.

Calyx-tube turbinate, gradually tapering into a pedicel shorter than itself, lid conical, conspicuously umbonate, not much shorter than the tube.

Stamens inflected in the bud, anthers small, nearly globular, dehiscing in oblong slits.

Ovary flat, the style thick and protruding.

Fruit obovoid, slightly constricted at the summit, the rim scarcely prominent and not thick.

Capsule sunk, valves 4, the points sometimes shortly protruding when open.

On clay shale, bases of Mounts House and Clifton (W.V.F.). Height, 25-40 feet, trunk to 15 feet, diameter 9-12 inches. Bark dark grey, persistent on the trunk and limbs and semi-fibrous, approaching that of a Box Eucalypt. Timber reddish to brownish, very hard and tough. Leaves $2\frac{1}{2}$ - $3\frac{1}{2}$ inches long, petioles $\frac{1}{2}$ inch. Peduncles about $\frac{1}{2}$ inch. Calyx-tube 2 lines diameter at the summit; stamens 2 lines; filaments white; fruit $4-4\frac{1}{2}$ lines long.

Affinity to *E. microtheca*, F.v.M.

Mr. Fitzgerald's remarks end here.

The only specimen I have seen is from base of Mount House, Western Kimberley, North West Australia (W. V. Fitzgerald, No. 962), consisting of flowering specimens, together with a few old fruits, evidently gathered at the foot of the tree.

RANGE.

Mr. Fitzgerald, as quoted below, says that the species appears to be restricted to the clay-shales of Mounts House and Clifton. In his "Kimberley Report," p. 12, appears the statement, "This (*E. argillacea* and several species of *Acacia* and *Grevillea*) clothe the shingly foot-hills and plains." These two references are the only ones known to me as to range. The two mountains are (the Surveyor-General of Western Australia obligingly tells me), Mount House (Munalin), Lat. $17^{\circ} 6' 8''$; long. $125^{\circ} 44' 15''$; Mount Clifton, lat. $17^{\circ} 17' 58''$; long. $125^{\circ} 52' 11''$.

In the above passage the name is *nomen nudum*.

AFFINITIES.

1. With *E. gamophylla* F.v.M.

The material available of *E. argillacea* is not complete, a very important deficiency under the circumstances being the juvenile leaves. In spite of the fact that *E. argillacea* is arborescent, and its opercula are more pointed than I have seen in any specimen of *E. gamophylla*, I am of opinion that while it is desirable to publish all the information available concerning *E. argillacea*, and give it a name, it seems very probable that it is a form of *E. gamophylla*. The drawings can be referred to to show the close affinity of the lanceolate-leaved stages. If it be not conspecific with *E. gamophylla*, that species is its closest affinity.

2. With *E. melanophloia* F.v.M.

In the "Western Mail" of 16th June, 1906, Mr. Fitzgerald publishes the statement that the present species "is a small tree allied to one of the east Australian Ironbarks (*E. crebra*) and appears to be restricted to the clay-shales of Mounts House and Clifton." The Ironbark referred to is *E. melanophloia* F.v.M. I have compared this species and *E. gamophylla* at p. 131.

3. With *E. microtheca* F.v.M.

Compare Part XI, Plate 52, of this work. *E. microtheca* is a medium-sized to large tree, with usually rough bark and deep brownish red timber. The juvenile leaves are petiolate and comparatively narrow, the opercula conoid; the anthers are not closely related, and the fruits very small, hemispherical, and with markedly exsert valves. The affinity does not appear to be a close one.

The above comparison may also be read with *E. gamophylla*.

Explanation of Plates (144-147).

PLATE 144.

E. Lehmanni Preiss.

- 1a. Juvenile leaf; 1b, intermediate leaf. Wilson's Inlet, west of King George's Sound, W.A. (S. W. Jackson.)
- 2a. Long, broad, strap-shaped peduncle, surmounted by young buds; 2b, mature leaf. Eucla, W.A. boundary. (J. Staer.) Cultivated.
- 3a. Mature leaf; 3b, small head of fruits, "South Coast, New Holland, (3c) Fraser, ex. herb. Lambert, in Cambridge Herbarium." This was collected at no great distance from King George's Sound.
- 4a. Head of buds, with an expanded flower. Note the remarkably swollen top (forming a kind of receptacle) of the peduncle, to which the sessile flowers are attached. 4b, Two views of anthers. Received from the late W. R. Guilfoyle, F.L.S., Director of the Botanic Gardens, Melbourne, and perhaps from a cultivated specimen. He may have got it in W.A., but I have mislaid his memorandum.
- 5a. Mature leaf; 5b, head of buds (note the somewhat flattened character of the operculum and its ridge); 5c, head of fruits. From a cultivated specimen at Staveley, near Hamilton, Victoria (W. V. Wardle.)

PLATE 145.

E. annulata Benth.

- 1*a*, 1*b*. Mature leaves; 1*c*, head of flowers, showing short, very broad peduncle; 1*d*, nearly ripe fruits, Phillips River, W.A. (L. Diels, No. 4869.)
 2*a*. Buds—note the expansion of the operculum towards the apex; 2*b*, two views of anther. Salt River, W.A. (George Maxwell.) The type.
 3. Head of fruits. Received from the late Mr. W. R. Guilfoyle without specific locality.

E. platypus Hook.

(See also Plate 146.)

- 4*a*. Portion of twig, showing mature leaves, buds and flowers; 4*b*, long, strap-shaped peduncle, with flowers; 4*c*, some not perfectly ripe fruits; 4*d*, end view of a ripe fruit. Drummond's No. 183. The type.
 5*a*. Juvenile leaf, thick and unsymmetrical; 5*b*, twig, bearing mature leaf and head of buds; 5*c*, two views of anther; 5*d*, fruits, almost winged. Main road and east of Growangerup, W.A. (Dr. F. Stoward.)
 6. Pendulous fruits. Growangerup, east of Broome Hill, W.A. (W. C. Grasby.)
 7*a*. Juvenile leaf, almost in early stage; 7*b*, mature leaf, not as wide as the type; 7*c*, mature leaf, very much narrower than that of the type, and undoubtedly the form referred to by Bentham as a doubtful variety; 7*d*, head of buds; 7*e*, head of fruits, with the valves partly exerted. Hopetoun, W.A. (J.H.M.)
 8. Head of fruits. Received from G. French, of Melbourne, without locality.

PLATE 146.

E. platypus, var. *nutans* Benth.

(See Plate 145.)

- 1*a*. Juvenile leaf, not quite in the earliest stage; 1*b*, mature leaf; 1*c*, strap-shaped peduncle and very young buds; 1*d*, head of buds; 1*e*, anthers; 1*f*, head of fruits; 1*g*, a fruit looking end-on. Kundip, near Ravensthorpe, W.A. (J.H.M.)

Transit forms between E. platypus Hook. and *E. spathulata* Hook :—

- 2*a*, 2*b*. Leaves of various shapes, 2*a* being the younger; 2*c*, long strap-shaped peduncle and buds; 2*d*, small fruits; 2*e*, large fruits. Near Ongerup, W.A. (Dr. F. Stoward.)
 3*a*. Nearly a juvenile leaf; 3*b*, mature leaf; 3*c*, buds; 3*d*, anthers; 3*e*, fruits. Near Kalgan River, Kalgan Plains, W.A. (J.H.M.)

E. spathulata Hook. (See also Plate 147.)

- 4*a*. Twig bearing buds and flowers; 4*b*, twig, showing very young buds; 4*c*, bud, the operculum about to fall; 4*d*, unripe fruit. Reproduced from the drawing of the type in Hooker's *Icones Plantarum*, t. 611.
 5. Twig with buds of Drummond's No. 68. (See p. 125.)
 6. Flowering twig of Drummond's No. 58. (See p. 125.)
 7*a*. Leaves; 7*b*, buds, the opercula chestnut-brown; 7*c*, anthers. Eulymartyrup, W.A. (Dr. F. Stoward, No. 125.)
 8*a*. Mature leaf; 8*b*, buds, opercula very rounded; 8*c*, fruits, which, like the calyx-tubes, are almost winged. Facup Creek. (Dr. L. Diels, No. 476 F.)
 9*a*. Leaves; 9*b*, buds; 9*c*, anthers; 9*d*, fruits. Note that they are not "much contracted at the orifice," as stated in the description of the fruits of *E. spathulata*. Broome Hill, W.A. (Dr. A. Morrison.)
 10*a*. Mature leaf, venation invisible; 10*b*, fruits, nearly globose. Cunderdin, W.A. (W. V. Fitzgerald.)

(NOTE.—8-10, if truly referable to *E. spathulata*, approach var. *grandiflora*, Benth.)

PLATE 147.

E. spathulata Hook, var. *grandiflora* Benth.

(See also Plate 146.)

- 1a. Mature leaf, venation scarcely visible; 1b, buds and flowers. The present surface of the operculum (an outer one having obviously dropped off) is rough and warty; 1c, fruits. Phillips Ranges, W.A. (George Maxwell.) Type of var. *grandiflora*.

E. gamophylla F.v.M.

2. Juvenile leaves (perfoliate or gamophyllous). North of MacDonnell Range, Northern Territory. (Lient. Dittrich, 1886.)
3. Perfoliate leaves and fruits. Note that they are more than "2 or 3" together. Near boundary of South and Western Australia. Elder Exploring Expedition (R. Helms, 17th July, 1891).
- 4a. Perfoliate mature leaves; 4b, leaves varying from perfoliate to sessile; 4c, anthers; 4d, fruits, rather long. Fortescue River, W.A. (W. A. Cusack, 1895, from Melbourne Herbarium.)
5. Twig with the mature leaves petiolate, and the flowers small, and arranged in a racemose manner. Central Australia. (See p. 129.) (Charles Winnecke.)
6. Sessile, short broad leaves. Thirty-five miles north-west of Meyer's Hill, Northern Territory. (G. F. Hill, No. 223, 2nd June, 1911.)
7. Leaves varying from perfoliate, sessile and petiolate, all on the same shoot. Henbury Station. Finke River. Northern Territory. (G. F. Hill, No. 45, 9th March, 1911.)

E. argillacea W. V. Fitzgerald.

- 8a. Twigs with mature leaves, buds and flowers. The leaves are of a very pale, opaque green; the venation is scarcely visible, and the intramarginal vein is lost in the edge of the leaf. The style exceeds the filament in length. 8b, Different views of stamens; 8c, fruits. Base of Mount House, Kimberley, North-West Australia. (W. V. Fitzgerald, No. 962, May, 1905.) The type.

The following species of *Eucalyptus* are illustrated in my "Forest Flora of New South Wales" * with larger twigs than is possible in the present work; photographs of the trees are also introduced wherever possible. Details in regard to their economic value, &c., are given at length in that work, which is a popular one. The number of the Part of the Forest Flora is given in brackets :—

- | | |
|--|--|
| <i>acacioides</i> A. Cunn. (xlviii). | <i>melanophloia</i> F.v.M. (liv). |
| <i>acmenioides</i> Schauer (xxxii). | <i>melliodora</i> A. Cunn. (ix). |
| <i>affinis</i> Deane and Maiden (lvi). | <i>microcorys</i> F.v.M. (xxxviii). |
| <i>amygdalina</i> Labill. (xvi). | <i>microtheca</i> F.v.M. (lii). |
| <i>Andrewsi</i> Maiden (xxi). | <i>numerosa</i> Maiden (xvii). |
| <i>Baileyana</i> F.v.M. (xxxv). | <i>obliqua</i> L'Hérit. (xxii). |
| <i>Baueriana</i> Schauer (lvii). | <i>ochrophloia</i> F.v.M. (l). |
| <i>Baueriana</i> Schauer, var. <i>conica</i> Maiden (lviii). | <i>odorata</i> Behr and Schlechtendal (xli). |
| <i>Behriana</i> F.v.M. (xlvi). | <i>oleosa</i> F.v.M. (lx). |
| <i>bicolor</i> A. Cunn. (xliv). | <i>paniculata</i> Sm. (viii). |
| <i>Boormani</i> Deane and Maiden (xlv). | <i>pilularis</i> Sm. (xxxi). |
| <i>Bosistoana</i> F.v.M. (xliii). | <i>piperita</i> Sm. (xxxiii). |
| <i>Caleyi</i> Maiden (lv). | <i>Planchoniana</i> F.v.M. (xxiv). |
| <i>capitellata</i> Sm. (xxviii). | <i>polyanthemos</i> Schauer (lix). |
| <i>Consideniana</i> Maiden (xxxvi). | <i>populifolia</i> Hook. (xlvii). |
| <i>coriacea</i> A. Cunn. (xv). | <i>propinqua</i> Deane and Maiden (lxi). |
| <i>corymbosa</i> Sm. (xii). | <i>punctata</i> DC. (x). |
| <i>crebra</i> F.v.M. (liii). | <i>regnans</i> F.v.M. (xviii). |
| <i>dives</i> Schauer (xix). | <i>resinifera</i> Sm. (iii). |
| <i>fruticetorum</i> F.v.M. (xlii). | <i>rostrata</i> Schlecht. (lxii). |
| <i>gigantea</i> Hook. f. (li). | <i>saligna</i> Sm. (iv). |
| <i>goniocalyx</i> F.v.M. (v). | <i>siderophloia</i> Benth. (xxxix). |
| <i>hæmastoma</i> Sm. (xxxvii). | <i>sideroxyylon</i> A. Cunn. (xiii). |
| <i>hemiphloia</i> F.v.M. (vi). | <i>Sieberiana</i> F.v.M. (xxxiv). |
| <i>longifolia</i> Link and Otto (ii). | <i>stellulata</i> Sieb. (xiv). |
| <i>Luehmanniana</i> F.v.M. (xxvi). | <i>tereticornis</i> Sm. (xi). |
| <i>macrorrhyncha</i> F.v.M. (xxvii). | <i>virgata</i> Sieb. (xxv). |
| <i>maculata</i> Hook. (vii). | <i>vitrea</i> R. T. Baker (xxiii). |

* Government Printer, Sydney. 4to. Price 1s. per part (10s. per 12 parts); each part containing 4 plates and other illustrations.



EUCALYPTUS LEHMANNI PREISS.

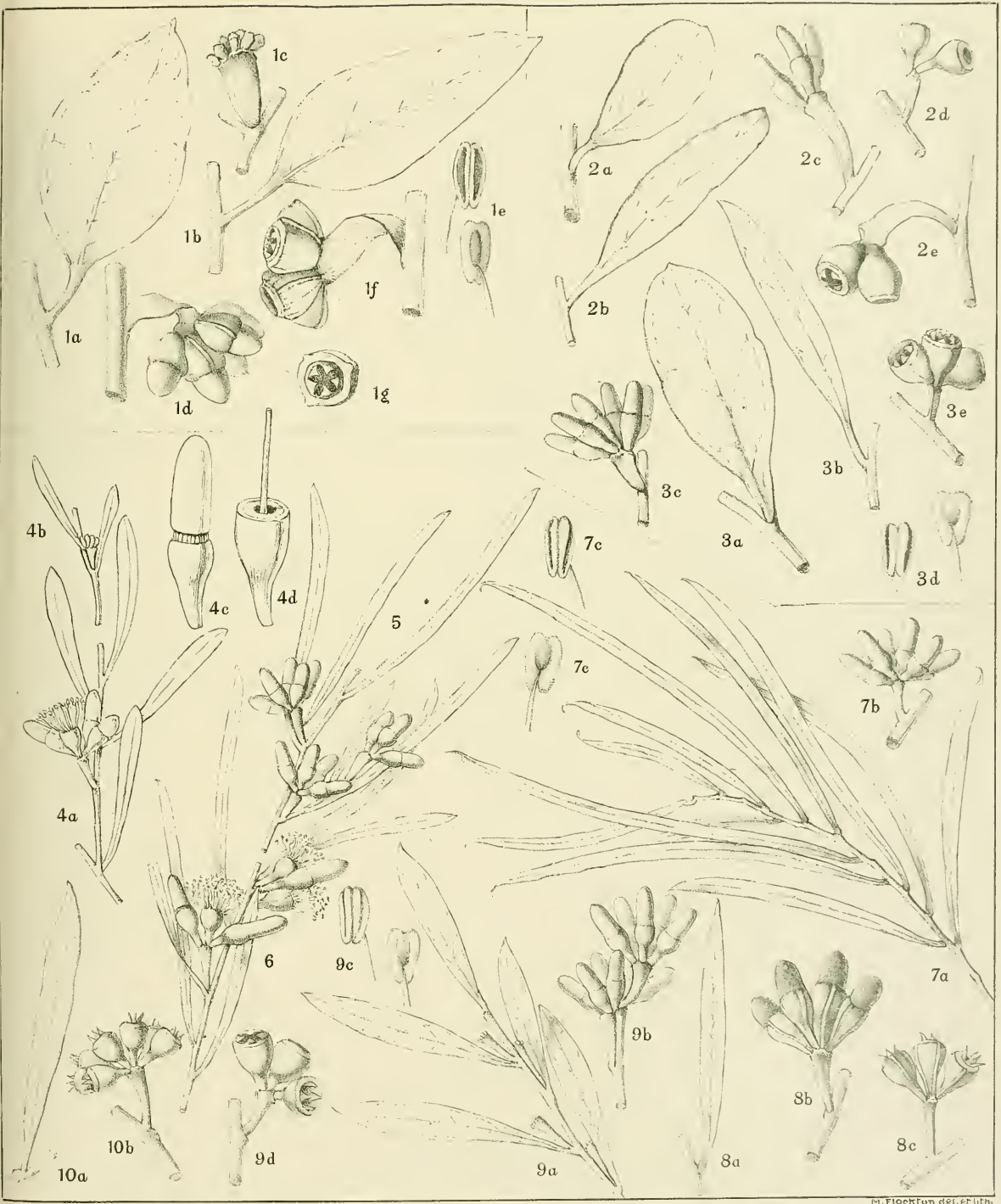
M. Flochton del. et lith.



M. Flockton del. & R. H. H.

EUCALYPTUS ANNULATA BENTH. (1-3).

E. PLATYPUS Hook. (4-8). [See Plate 146.]



M. Floeckner del. et lith.

EUCALYPTUS PLATYPUS Hook. var. NUTANS BENTH. (1). [See Plate 145.]

Transit forms between E. PLATYPUS Hook., and E. SPATHULATA Hook. (2, 3).

E. SPATHULATA Hook. (4-10). [See Plate 147.]



M. FROEHLER del. et lith.

EUCALYPTUS SPATHULATA Hook., var. *grandiflora* BENTH. (1). [See Plate 146.]

E. GAMOPHYLLA F.v.M. (2-7).

E. ARGILLACEA W. V. FITZGERALD. (8).

DESCRIPTION.

CLXXXII. *E. occidentalis* Endlicher.

In *Enumeratio Plantarum*, Huegel, 49 (1837).

FOLLOWING is a translation of the original :—

Leaves alternate, oblong-lanceolate, acuminate, with a vein parallel to the margin, umbels axillary, peduncle flat-compressed, longer than the petiole, pedicels somewhat compressed, twice as short as the campanulate cylindrical calyx-tube.

Operculum conical, terete, coriaceous, a third longer than the calyx-tube.

Fremantle,* Swan River (Huegel).

Distinguished from *E. resinifera* by leaves more shortly acuminate, flat compressed, bilinear peduncle, broader towards the apex, somewhat compressed pedicels, twice as short as the calyx-tube, which is 3 lines long. The operculum finally becomes a third longer and not twice as long as the calyx-tube.

Then Schauers, in *Plantae Preissianæ*, i, 128 (1844-5), redescribed it and gave Cape Riche and the Gordon River as additional localities. Mueller, in *Fragmenta* ii, 39 (1860) added information.

Bentham (B. Fl. iii, 235) (1866) gave the first English description of the species, as follows :—

A tall shrub or tree, attaining sometimes 80 feet (Oldfield).

Leaves from oval-oblong and under 2 inches to narrow-lanceolate falcate and above 4 inches long, very thick, with oblique veins scarcely conspicuous or rarely prominent underneath, the intramarginal one a little distant from the edge.

Peduncles axillary or lateral, more or less flattened and often recurved, with three to five flowers on rather thick pedicels of 2 to 3 lines.

Calyx-tube urceolate-oblong, 3 to 4 lines long at the time of flowering, smooth or obscurely ribbed, usually somewhat dilated at the orifice.

Operculum $\frac{1}{2}$ to $\frac{3}{4}$ inch long, very obtuse or rarely almost acute.

Stamens $\frac{1}{2}$ to $\frac{3}{4}$ inch long, erect as in *E. cornuta*; anthers oblong, with parallel cells.

Ovary very convex or conical at the top.

Fruit urceolate, 6 to 8 lines long when full grown, about 5 lines diameter at the top and narrower below, the rim narrow, not prominent, the capsule somewhat sunk but conical in the centre, and the valves protruding when open.

Mueller ("Eucalyptographia"), figures the species (with leaves as coarse as *E. agnata* Domin, see below, p. 138) and gives additional particulars.

The filaments are creamy-yellow. Note the distinctly campanulate fruits.

The timber of the Flat-topped Yate is brown, with gum-veins, or, in small stems, pale coloured with darker brown heart.

* It does not occur at Fremantle, and this statement is a slip of the pen.

SYNONYM.

E. agnata Domin; (*agnata*=cognate or allied).

Following is a translation of the original:—

Tree-like, branchlets slender, the remains of the petioles decurrent and angular.

Leaves alternate, rather distant from each other, broad or almost ovate-lanceolate, contracted, rhombus-like, at the base into a rather long petiole (about 2 cm. long), sub-falcate and mostly inequilateral without petioles, about 13–17 cm. long and $3\frac{1}{4}$ –4 cm. broad, glaucescent, coriaceous, and rather thick, midrib prominent, lateral nerves diverging obliquely, conspicuous on both sides.

Peduncles 2–2½ cm. long, flattened, and with a subdilated apex, almost 5 mm. broad, erect, pseudo-terminal and growing out of the axils of the topmost leaves, bearing a crowded, 3–6 flowered umbel; flowers sub-sessile—i.e., the pedicels rather thick and very short, about 2–3 mm. long.

Receptacle urceolate under the expanded flower, about 6–7 mm. long and above (the orifice) broader than long, smooth.

Stamens yellow, erect, about 12 mm. long, hardly bent in the buds and not flexuose; anthers oblong, at least twice as long as broad, cells of the anthers parallel.

Operculum about 10–11 mm. long, very obtuse, about 8 mm. at the base (transverse diameter), about 5 mm. broad at the apex.

Fruit urceolate, but not perfectly ripe, about 8–9 mm. long, and just as much broad at the interior margin of the orifice, adorned with a brown lobulate-gibbous ring; the conical capsule distinctly protruding and further crowned with an elongated style.

Western Australia. Slab Hut Creek to Cranbrook, Great Southern Railway. Collected by Capt. A. Dorrien Smith, 1910.

The species is closest to *E. occidentalis*, but is distinguished by its large, broad leaves, sub-sessile flowers, operculum and fruit. *E. occidentalis*, in various localities, displays strange forms, but the plant above described seems to differ specifically from the forms and all varieties.

E. cornuta and *E. annulata* are distinguished at first sight from our species by the leaves, operculum, and also the fruit. (Fedde's *Repertorium Specierum novarum regni vegetabilis*, Band XII, No. 25/27, Sept., 1913, p. 389.)

I have a note on this species at p. 140.

The Name "Mallet" and its Derivatives.

The earliest use of the name known to me is by the botanical collector, J. Drummond, written in 1839 to Sir W. J. Hooker.

The beautiful pink Cockatoo, named after Mr. Leadbeater, is common in this part of the country. These birds come in flocks to the neighbourhood of the Avon to feed on the seeds of the *Blackboy* (*Xanthorrhoea*) and flowers of the *Red Gum* (*Eucalyptus calophylla*); the natives tell us they breed in the tops of a very high species of *Eucalyptus*, which they call *Mallet*, and which grows a day or two's journey to the east of where we were; the *black Cockatoo*, with red bars across the tail, is reported by them to breed in the same tree. (*The Journal of Botany*, W. J. Hooker, Vol. 2 (1840), p. 361.)

Captain Lort Stokes, in his "Discoveries in Australia," ii, 132 (1846) has "Mallat," a native name for a species of *Eucalyptus*, "tall, straight, with rough bark." He collected the names about 1840. This is the name (usually spelt "Mallet" now) applied to a variety of this species, see below, p. 142. The normal form of the species usually goes under the name of "Flat-topped Yate," or "Swamp Yate."

E. occidentalis has two forms, a shrubby and a tree form.

In the shrubby state several stems originate from one root, but they may attain 20 feet in height; in favourable localities, such as sheltered valleys with better soil and on banks of streams, a tree rising to 120 feet. (Mueller, "Eucalyptographia.")

Oldfield records this species as flowering already when only 3-4 feet high on sand-ridges, but where probably the bushes were previously burnt to the root (*ibid.*). (This surmise is not correct in many cases, as it naturally flowers in quite a small stage, and not merely on shoots emerging from a burnt stump.—J.H.M.)

E. redunca (see Part XXXIV) has also a shrubby and a tree form, and other species could be cited.

Following is a translation :—

This species takes on a strongly polymorphic habit. As a shrub it often flowers freely; it has been observed with a sub-terete peduncle or with broadly flattened pedicels sometimes shortened and displaying other variations.

We have seen the tree 8 metres high, with ash-coloured bark, glaucous, rather narrow leaves, glands (when dry) showing dark dots, peduncles scarcely dilated, somewhat spreading. In the Avon district near Wyola in open scrub, flowering in October (D. 5023). Diels and Pritzel in *Engler's Jahrb.*, XXXV., 442 (1905).

Later on Dr. Diels said :—

In Eucalyptus it is also not rare that trees and shrubs of the same species grow and flower nearly side by side. Dr. Pritzel and I observed this in the plains west of the Stirling Range in the case of *E. occidentalis*; we saw trees 20 metres high in full flower, and also shrubs little more than 1 metre high were in full flower; they grew on soil rather more compact than the trees. (L. Diels "Jugendformen und Blütenreife.")

What appeared to be a dwarf form of the "Flat-topped or Swamp Yate" I found on the descent from the Porongorups foot-hills to the Kalgan Plains, and bearing the local name "Bastard Yate." It consists of thickly disposed saplings of 10-15 feet, very tough, used locally as whip handles. With Mallee-like stocks, and the foliage and twigs with a slightly glaucous look. This would be an intermediate form.

The true Yate is *E. cornuta* Labill. It is sometimes called "Black or Hill Yate" in contradistinction to the "White or Swamp Yate," which is *E. occidentalis*. The branches of the latter are whiter than those of the Black Yate.

The term "Flat-topped Yate" is not in use at the Porongorups, so far as I could ascertain. It is, however, coming into use as applied to the Mallet Bark tree, although the Swamp Yate is flat-topped also. The term "Flat-topped Yate" is in use for *E. occidentalis* in other parts of the State.

"Mr. Muir noted a variety of Yate which has the mass of its foliage flat-topped" (Mueller in "Forest Resources of Western Australia," p. 8). Perhaps he simply meant the "Flat-topped Yate" (*occidentalis*). The name Yate as applied to more than one species has caused some confusion. Mueller, in "Eucalyptographia," calls *E. occidentalis* the "Flat-topped Yate," but apparently in the passage just quoted he looked upon *E. cornuta* as having a flat-topped form, but I did not see, nor could I hear of such a form of *E. cornuta*.

There are two forms of *E. occidentalis* whose chief distinction appears to lie in the bark, viz., the "Flat-topped or Swamp Yate," and the "Mallet." Endlicher's description of the species throws no light on the character of the bark, but I think it is a fair assumption that the "Flat-topped Yate" is referred to. This is the tree well-known for many years, and I describe its appearance as follows :—

1. An erect tree with flat tops. The bark blackish and furrowed (on the lower half of the trunk), then flaky or feathery with black twisted strips, like a French fowl, for approximately the remaining half, then with smooth branches. (See my notes in *Journ. W. A. Nat. Hist. Soc.* iii, Jan., 1911.)

2. Oldfield's way of describing the bark is "Bark of trunk persistent, half-fibrous, hard, fibres crossed, limbs white, very smooth, branches red."

3. Mueller's description is, "Stem of aged trees to a considerable extent smooth the outer rough, the more corky and somewhat fibrous portion delapsing in thin hard pieces partially. Limbs smooth and whitish . . . bark of twigs reddish brown." ("Eucalyptographia") He does not take cognisance of the bark of two forms.

As regards the *leaves* also we have two forms :—

1. Narrow-leaved, like Drummond's No. 152.

2. Broad-leaved, like Drummond's No. 74; Mueller's figure in the "Eucalyptographia" and Domin's *E. agnata*,

but so far I have not been able to correlate this variation of foliage with variation in size of plant, difference of bark, or any other character which would enable one to carve out a second species.

Bentham says : "In some of Drummond's and Oldfield's specimens the leaves are smaller and narrower, the calyx and fruit smaller, the orifice slightly contracted, and the very small valves scarcely protrude." (B. Fl. iii, 236.)

RANGE (of normal species).

The type came from Fremantle, according to the original describer, but this is wrong, and doubtless arose through a mixing of labels. I could not find it in the Fremantle district; lately I invited Dr. Stoward's attention to this very point, and he says that it does not occur there.

Bentham gives the range, quoting Maxwell, as from the Kalgan River and the west end of the Stirling Range, eastward to Cape Riche and Cape Le Grand.

Mueller ("Eucalyptographia") defines it as "from the Tone River to regions inland near Cape Le Grand and the Broken Ranges near Orleans Bay, forming part of the scrubs known to extend about 40 miles northward of Edieup and to ascend high up the Stirling Range, occurring on clayey as well as on sandy soil, also occupying

wet places." In other words, it is a south and south-western species. The extreme localities appear to be, say, 50 miles west of the Great Southern Railway, and a few miles north of the Eastern Railway in the York district, thence south-easterly to Esperance. In its dry country form (var. *eremophila*) it goes east as far as 140 miles east of Kalgoorlie on the Transcontinental Railway.

We have (A) dwarf plants (shrubs), (B) trees of various sizes, and (C) Mallets (smooth barks), and this may be a useful classification until we know more of this protean species.

(A) The following are *dwarf plants* :—

"Mallet Scrub," seems otherwise typical, Kalgan Plains (J.H.M.). "Mallet Scrub" seems smaller in all its parts, Kalgan River (J.H.M.). "Mallet Scrub," small cylindroid fruits, near Kalgan River bridge, Kalgan Plains (J.H.M.).

"Mallet Scrub" is specifically identical with the Swamp Yate and Mallet tree, but it forms dense masses of spindly stems where I saw it, and I saw it in many places on the Kalgan River and Plains; it is not of any size, and affords another instance of a tall tree being represented by a shrubby form. (J.H.M. in *Journ. W.A. Nat. Hist. Soc.*, iii, Jan., 1911.)

Stirling Range (E. Pritzel, No. 705).

Below I have suggested that this Mallet Scrub may not belong to the true Mallet, and, therefore, not to var. *astringens*.

"Say 12 feet. Poor sandy laterite and clay." 15 miles or so on Salt River road, south-east of Growangerup, and say 20 miles north of eastern end of Stirling Range. (W. C. Grasby.)

Shrub from 7-8 feet. Roadside, main road between Growangerup and Broome Hill. (Dr. F. Stoward, No. 125.)

"Marlock," forming thickets, Broome Hill (T. Carter per O. H. Sargent, No. 685).

Huegel (*Pl. Preiss*, i, 128) records it as having been collected by Preiss in 1840 on sterile soil at Wuljenup, Cape Riche (past flowering, Herb. Preiss, No. 240), and in similar places near the Gordon River, Hay district (fruiting specimen, Preiss, No. 228). These plants are shrubby (fruticosa). I have no particulars as to the sizes of Drummond's 152 or 74.

(B) The following are *trees* :—

Mueller (Fragm. ii, 39) says it attains a height of 120 feet.

"Swamp Yate," Porongorups, Kalgan Plains, north of Kalgan River; foot of Stirling Range. Some of these specimens flowering in the broad-leaved stage (J.H.M.). This includes *E. agnata* Domin.

"Swamp or Flat-top Yate Gum." Height up to 90 feet and up to 3 feet in diameter. Specimen from young tree of 15 feet. Along the Great Southern Railway from Katanning, south past Mt. Barker, east to the Beaufort and Hay Rivers, and west to the Palnup River, chiefly on swampy ground. Specimen from spot half way between Dunn and Phillips' farms, Kalgan Plains (Dr. Stoward, No. 120a).

North-west Plantagenet (Dr. E. Pritzel, No. 345).

"Flat-topped Yate," Cranbrook, with *E. redunca* (Dr. L. Diels, No. 2969).

Height from 80-90 feet. Specimen from mature tree near Government Dam, Peringillup, Great Southern Railway (Dr. Stoward, No. 1206).

Near Wickepin; no other particulars (Dr. F. Stoward, No. 55).

Tree of 8 metres, grey bark. Wyola, Avon district (Dr. L. Diels, No. 5023). (A Mallet, if by "grey," a smooth bark is meant).

VARIETIES.

1. var. *astringens* Maiden.

2. var. (?) *stenantha* Diels.

3. var. *eremophila* Diels.

Note on *E. erythronema* Turcz., var. *Roei* Maiden.

4. var. *grandiflora* n. var.

For a note on var. *oxymitra* Diels, which = *redunca* var. *oxymitra*, see p. 150.

1. Var. *astringens* Maiden.

We now come to the form which has come into prominence during the last few years because of the commercial value of its bark, known as "Mallet."

I reiterate that I could not find important botanical differences in flowers and fruits (but see below, p. 143) between this and the "Flat-topped Yate," but the Mallet is invariably smooth-barked and valuable as a tan-bark, while the "Flat-topped Yate" has a rough bark, which is economically valueless at present.

I proposed the variety name *astringens* for the Mallet, as it seems very desirable to have a distinctive name for it, and I give a few notes on the tree. I refer below to the Mallet from an economic point of view, for I spent a good deal of time investigating it.

It is a *Gum*, i.e., it has a smooth bark in contrast to that of the Swamp Yate. It is erect in habit. The bark has more or less of a leaden colour externally, and as the older skin cracks and flakes away, it becomes in patches almost white. Its bark usually contains a more or less well defined layer of friable brown kino, which is quite evident to the eye, and the fracture discloses such. The presence of this kino is used as a diagnostic character in the trade.

The timber is tough, and of a pale brown colour.

The sucker leaves are broadish and slightly glaucous.

Swamp Yate and Mallet sometimes grow side by side and yet preserve their individuality.

Mallet strippers and others, whom I have consulted over large areas, pooh-pooh the idea of the two trees being identical. (*Journ. W.A. Nat. Hist. Soc.*, vol. iii, Jan., 1911.)

I wrote the following account, which was published in the *Kew Bulletin*, Article x, p. 114 (1911):—

The Mallet Bark of Western Australia.—*Eucalyptus occidentalis* Endl.,
var. *astringens* Maiden.

This has been a well-known article of commerce for the last six years at least, and as there has been some doubt as to its botanical origin, I spent a good deal of time during my botanical journey in Western Australia (September–December, 1909) in endeavouring to clear up the matter.

The ordinary “Flat-topped Yate” is, in my view, typical *Eucalyptus occidentalis* Endl. It is a tree with black, hard bark, for the lower half of the trunk, while the upper half of the bark is black and feathery, the loose bark quivering in the wind strongly reminding one of the feathers of a French fowl. The branches are more or less smooth or ribbony. The bark of this form has no commercial value.

The Mallet is a smooth barked Eucalypt—a Gum in Australian parlance. It also is more or less flat-topped, but quite distinct in appearance to the ordinary Flat-topped Yate. No bushman that I consulted would ever allow that the trees are the same.

I have described the Mallet as a variety (*astringens*) in the *Journ. Nat. Hist. and Science Society of W.A.*, 1910.

The ordinary Yate is *E. cornuta* Labill. “The tops of a very high species of Eucalyptus which they (the natives) call Mallert.” (Jas. Drummond) in Hooker’s *Lond. Journal Bot.* This is the first instance I can find of the use of the name, which is always now called “Mallet,” although one hears of other spellings, e.g., “Mallat.”

Following are some bibliographical references to Mallet bark:—

1. “Source of the new bark industry, *Eucalyptus occidentalis*, the Flat-topped Yate”; by Dr. A. Morrison, *Journ. Agric., W.A.*, September, 1904, p. 177.

(This is Mallet bark which is a flat-topped tree. “Flat-topped Yate” is *E. occidentalis normalis*, J.H.M.)

2. “Mallet Bark,” by E. M. Holmes, *Phar. Journ.*, 4th February, 1905, p. 141.

3. “Mallet Bark,” by T. R. Sim—*Natal Agric. Journ. and Mining Record*, March 24th, 1905. Vol. VIII., No. 3, p. 209.

4. “An investigation of the barks of four West Australian species of Eucalyptus,” by Henry G. Smith, *Journ. Agric., W.A.*, 20th April, 1905, p. 219.

5. “Mallet Eucalypt bark, better than Black Wattle,” by D. E. Hutchins, *Agric. Journ. Cape of Good Hope*, June, 1905, p. 784.

The commercial Mallet trees occur in a north and south strip of the South-eastern part of the State, practically following the Great Southern Railway from Beverley or Brookton to Mount Barker, and at a distance of about 40 miles on either side of the line. It is now prohibited by the Forest Department to cut Mallet bark from any portion of the area 20 miles each side of the Great Southern Railway. It can be legally stripped from 1st March to 1st November.

The Acting Inspector-General of Forests informs me that the industry has fallen off during recent years, owing to the Mallet within payable cartage of the Great Southern Railway Line having been cut out. The quantity of bark exported has fallen off from 318,315 cwt. in 1905 to 226,399 cwt. in 1908.

The truck loads of Mallet bark at so many stations on the Great Southern Railway are a feature which serves to impress the magnitude of the industry on the memory.

In Western Australian commerce there are two recognised kinds of Mallet bark, viz. :—

(a) Brown Mallet (commercially the more valuable).

(b) White Mallet.

There is a "spotted Mallet" of which only 5 tons have been handled by a large firm, specially interested in this trade (Messrs. Henry Wills and Co., of Albany), and this kind may be dismissed from notice for the present.

Stained inferior pieces known as Black Mallet, are sometimes disposed of under a different brand and name. Sometimes white Gum bark (*E. redunca*, and other species) is mixed by the strippers as an adulterant or unintentionally.

The pieces or strips are sent in by strippers in lengths of about 3 feet, and commonly 6 inches wide.

Brown Mallet is the better and usually contains exudations of a brownish, friable kino, which is quite evident to the eye, and a fracture discloses such. Externally it is whitish (brown stained), with greyish blotches. It would be classed by bushmen as a "White Gum."

I studied the Brown Mallet trees in the bush in several districts, and following are notes made by me on the spot in two of them.

Narrogin—Erect in habit, both as regards trunk and branches. Flat-topped like a broom or brush.

Grows on rises or ridges, not on swamps or flats; therefore only in patches, and not in large continuous areas. Grows on ironstone gravel and not on alluvial. Mr. J. H. Gregory (the local District Forester) has often seen Mallet 2 feet 6 inches in diameter. He has seen 10-15 bundles of bark from one tree, the weight of bark being usually 50-70 lb. per bundle dry.

It may attain a diameter of several feet, but trees of such size have been destroyed in accessible places. It forms a dense, almost impenetrable thicket of young saplings, and it seems to me that it would handsomely pay to thin out such saplings scientifically.

2. Near the Kalgan River bridge, Albany, Porongorups to Stirling Range (near a sandstone cliff) we came across some Mallets which were being stripped for their bark. The trees are small, say, 9 inches to 1 foot (I am informed there were some 18 inches). Bark perfectly smooth, dark and glossy. Underneath the bark is a layer of kino uniformly distributed. This is the Brown Mallet.

Through the kindness of Messrs. Henry Wills and Co., I obtained commercial samples of the White Mallet. This bark has a pinkish fracture and little or no kino. It is a "cleaner" bark than the Brown Mallet; that is to say, a white smooth bark with few stains of any kind.

Mr. J. H. Gregory described the White Mallet tree to me as more straggly than Brown Mallet. He says it is like a White Gum (*redunca*) and that one locality is 20 miles from Narrogin (near the Williams River).

To me it was a "Will o' the Wisp." Any White Mallet trees shown to me were similar to Brown Mallets, and I travelled many a mile after the White Mallet. Brown Mallets I felled myself and took herbarium specimens, but it remains to be proved if the White Mallet differs botanically from the Brown one.

Mallet bark is chiefly shipped to the Continent of Europe (largely, perhaps mainly) from Albany, and principally to Hamburg and Antwerp. For these two markets it is sent in sacks, broken or crushed into pieces about 2 inches long.

There is a smaller market for it in the eastern States, principally New South Wales and Victoria, and for those markets it is shipped in powder.

For shipment from Albany it comes from Tambellup, Katanning, and even more northern railway stations.

The price of Mallet bark was £4 15s. a ton on the trucks in 1909. Broome Hill seems a very active centre for it, in fact, the local police say it is *the* centre. (Attached to this paper was a copy of the regulations controlling the stripping of Mallet bark 28th March, 1906, made by the Forest Department of Western Australia.)

The timber is pale-coloured, pinkish, very free in my specimen, and tough.

It would appear that this variety is related more closely than the other varieties to the normal form. It appears to have smaller fruits and flowers than the normal form (as small as those of Mallet scrub, which may turn out to belong to var. *astringens*), and with fruits certainly less campanulate. Perhaps these aggregate differences may constitute it worthy of specific rank.

RANGE (of var. *astringens*).

This has been, perhaps, already sufficiently stated, and a few additional notes follow :—

“ Mallet,” Kalgan River bridge, Kalgan Plains. (J.H.M.)

“ Mallet,” operculum shorter and fruits smaller than type, Broome Hill. (J.H.M.)

“ Brown Mallet,” Narrogin. (J. H. Gregory, J.H.M.)

“ Brown Mallet.” Tree of 50 feet and up to 2 feet diameter. Grows in Eastern districts, York to Cranbrook, east and west of Great Southern Railway. Valuable commercially for tanning purposes. Reserve near Peringillup Siding, No. 4572. (Dr. F. Stoward, No. 94).

“ Grows only in bed of Salt River. It is now (1911) being stripped for tanning purposes all along the Salt Water River, where it grows.” Near Meare’s Lake, County Peak, Beverley. (H. H. St. Barbe More, O. H. Sargent, No. 707). Mr. Sargent further says : “ This Salt River arises 100 miles or so north of Tammin, and divides itself into two branches near Mt. Stirling. One branch proceeds east, and the other more or less west, and joins the Avon near Mt. Kokeby. This is a tree with rough bark at the butt (like so many smooth-barked trees) and smooth above. The leaves are narrow and the fruits conoid with slender peduncles and petioles. The opercula are slender also. It is a graceful form as far as the specimens go, but I cannot see any difference between this and var. *astringens* from more southern localities on the Great Southern Railway.

Chiefly from the notes on the bark, but, in some cases, from other information, I suggest that the following specimens may also belong to var. *astringens* :—

Tree about 35 feet, smooth whitish bark on trunk. Ironstone Hill, near Cut Hill, York (O. H. Sargent, No. 302).

“ Mallert.” “ Arborescent, 40–70 feet high. Habit of Gimlet wood. Bark contains 45 per cent. tannic principle; now (1903) exported.” Hills around Pingelly (W. V. Fitzgerald). In Part XXXIV, p. 99, it will be observed that Mr. Fitzgerald gives a similar percentage of tannin to *E. accedens* from the same locality. It should be ascertained whether the statement is a coincidence or a mistake. The herbarium specimens are those of normal *occidentalis*.

Tenterden (Dr. A. Morrison). “ Mallert,” Mt. Barker (W. V. Fitzgerald). West from Yetemerup, also Red Gum Pass, Stirling Range (Dr. A. Morrison). North side of Ellen’s Peak, Stirling Range (Dr. A. Morrison). Sand Plains, east of Stirling Range (Cecil Andrews). Kundip, near Ravensthorpe (J.H.M.). Lynburn, Alexander River (H. P. Turnbull).

2. Var. (?) *stenantha* Diels.

I cannot find that Dr. Diels has anywhere described his variety, and all that I have seen of it is a specimen from which fig. 6, plate 149 has been prepared. The name means, of course, "narrow-flowered," and refers to the narrowness of the calyx-tube, as shown in the figure. In its comparatively narrow peduncles, in its pedicels, and in the contour of the unripe fruit, it seems nearest to *E. occidentalis*, but in the absence of ripe fruits and of other material, it is impossible to say what justification there is for looking upon it as a variety.

Dr. Diel's label is as follows, from which it is stated that it occurs at Lake Cowan and its number is 5,245. I hope local collectors will give attention to it:—

"*E. occidentalis* Endl., var. *stenantha* Diels, in ditione Coolgardensi pr. lacum Cowan; in fructicetis apertis solo limoso lapidoso." (L. Diels, No. 5245, 1st November, 1901.)

3. Var. *eremophila* Diels.

Following is a translation of the original description:—

Tree-like, up to 5 metres high, leaves linear-lanceolate, coriaceous, shiny, not glaucescent; peduncles flattened, pedicels often elongate. Otherwise similar to the type.

Found in the Coolgardie district, near Boorabbin, in gravelly places, flowering in the month of November (E. Pritzel, No. 917), near the town of Coolgardie, in open scrub-lands in sandy, muddy places, flowering in the month of November near Gilmores. (Diels, No. 5,264, *Engler's Jahrb.*, XXXV. 442, 1905.)

To Dr. Diels' description may be added that the fruits are cylindroid (sometimes more spherical) not urceolate as in the normal species, and that the top of the capsule is flattish when not fully ripe, is nearly flush with the top of the rim, giving the fruit, when not fully ripe, a characteristically truncate flattish appearance. When the fruit is ripe, its mouth becomes rounded and somewhat contracted.

For a discussion on the position of var. *eremophila*, as compared with *E. platypus*, see below, p. 151.

RANGE (of var. *eremophila*).

This is a dry country form, and its range may be stated as bounded by Watheroo on the Midland Railway, to 140 miles east of Kalgoorlie, and north of Esperance and back again to the vicinity of the Great Southern Railway. It probably has a very extensive range in country of low rainfall.

The first two specimens which follow are mentioned by Dr. Diels in his description:—

"Shrub 4 metres high, flowers yellow, calyptra (opercula) reddish." Near Coolgardie (Dr. L. Diels, No. 5237). Coolgardie, or rather, Boorabbin (E. Pritzel, No. 917). I have also received it from Coolgardie (L. C. Webster).

Then we have it from near Warangering, Elder Exploring Expedition (R. Helms, November, 1891). The expedition would be then in the Coolgardie district, but I do not know the latitude and longitude of Warangering. The filaments dry reddish brown, and were probably crimson when fresh.

It appears to be similar to the following :—"Pink Mallee," "Hillgrove," Yardin, Quairading—Bruce Rock Railway (C. Smith, communicated by W. C. Grasby). This has beautiful crimson filaments, and is very decorative. It is a crimson-flowering form of a variety whose filaments are normally cream-coloured to yellow, and adds another to the long list of bi-coloured species and varieties. Its branchlets are glaucescent.

We have another specimen collected by Mr. R. Helms in the Elder Exploring Expedition, viz., at Camp 63, on 27th September, 1891. The Expedition was then in the Victoria Desert, a few miles south-east of Queen Victoria Spring (the Expedition was at the Spring on the 25th). The soil was recorded as clayey-sand, and the specimen was labelled "*Eucalyptus*, No. 11," being one of a number of species of this and other genera that Mueller and Tate did not come to a decision about. Its height is given as 25-35 feet, showing that var. *eremophila* may attain the dignity of a fair-sized tree, and that it does not always remain a shrub.

"Tree of 30-40 feet. Smooth scaly bark. 140 miles east of Kalgoorlie, on the Transcontinental Railway Survey (Henry Deane). With rather large fruits and lanceolate leaves (see fig. 11, Plate 149). This is the most easterly locality for var. *eremophila* so far.

Going south we have it from between Norseman and Esperance in fruit only (Dr. L. Diels, No. 5831).

Turning west from the Coolgardie district, we have it from Bruce Rock, Merriken district (Dr. F. Stoward, Nos. 37 and 38); also Totadjin (Dr. F. Stoward, No. 41); also Kellerberrin (F. H. Vachell), which is the furthest recorded western locality on the railway line. Then we have it from very much further north, "Tall shrub, Watheroo rabbit fence, on sand plains" (Max Koch, No. 1610). This Watheroo is a railway station on the Midland Railway.

The following specimen is from a locality much to the south-east of any other specimen of var. *eremophila* recorded :—

Growangerup, 30 miles east of Broome Hill (W. C. Grasby). This is very near to var. *eremophila*, but the leaves are not so glossy, and the pedicels are more slender and rather longer.

Note on *E. erythronema* Turcz., var. *Roei* Maiden.

This was founded on a sheet of specimens in the Vienna Herbarium, and is referred to in Part IV, p. 110, and Part XXII, p. 24, of this work. Having further investigated the matter, I confirm my previously expressed opinion that the material on the sheet is mixed, and say that the twig with buds is *E. erythronema* Turcz., while the fruits are those of *E. occidentalis* Schauer, var. *eremophila* Diels. The supposed variety *Roei* therefore falls to the ground.

4. Var. *grandiflora* n. var.

A shrub or small tree with long supple branchlets, leaves not very shiny, filaments yellow, fruits cylindroid, and the largest seen in the species, being 1.5 cm. long and 1 cm. in diameter. Kurrawang, near Kalgoorlie, W.A. (Dr. J. B. Cleland.) I propose the name variety *grandiflora* for this form.

I have a leaf and two fruits (no buds) of the following, which appears to belong to this variety :—

A tree of 25-35 feet, in clayey-sand, Camp 63, a few miles south-east of Queen Victoria Spring, W.A., 27th September, 1891 (R. Helms, Elder Exploring Expedition).

I was at first inclined to consider this a coarse form of var. *eremophila*, but against that view I have to consider, that the only calyx-tubes I have seen taper gradually into the operculum. The affinity of var. *grandiflora* is, therefore, with the normal form of *E. occidentalis*, rather than with the variety *eremophila*. But there is still a good deal of inquiry yet to be made in regard to the various forms of *E. occidentalis*, before we can finally classify the different forms.

E. eremophila var. *grandiflora* is interesting because it is related to *E. Pimpiniana* Maiden (this work, part XVI, p. 211), a species of obscure relations, partly because of the paucity of the material known. But the leaves of *E. Pimpiniana* and of the variety are very different, so far as the available material goes.

E. Stowardi Maiden (*Proc. Roy. Soc. N.S.W.*, LI, 457, 1917 (1918), has evidently some affinity.

AFFINITIES (to *E. occidentalis*).

1. With *E. resinifera* Sm.

This affinity was mentioned by Endlicher, the describer of *E. occidentalis*, but the relations are not close. *E. resinifera* is an east Australian species, and is figured in Part XXX. I only take note of it here because of Endlicher's remark, for botanists were hazy as to *E. resinifera* in his day.

2. With *E. grossa* F.v.M.

"*E. grossa* is removed from *E. occidentalis* by generally broader and thicker leaves, shorter and stouter flower stalks, absence of stalklets, proportionate shortness of the calyx-lid, filaments inflexed in their earliest state and of less rigidity, and entirely closed fruit valves Some shrubby specimens of *E. occidentalis*, verging to *E. obcordata*, but being narrow leaved, were placed by Bentham doubtfully with *E. grossa*." ("Eucalyptographia," under *E. occidentalis*.)

For figures of *E. grossa* see Part IV, Plate 18, and Part XVI, Plate 72. In *E. grossa* the peduncle is shorter and flatter, the operculum shorter and more conoid, the fruit more cylindroid. We know very little about *E. grossa*, and I hope that our Western Australian friends will be on the lookout for it.

3. With *E. redunca* Schauer.A. Note on *E. redunca* var *oxymitra* Diels.

Following is a translation of some remarks by Drs. Diel and Pritzel :—

"The Series Cornutæ of Bentham, with stamens erect in the bud, is represented in Western Australia by aberrant forms. Sometimes it shows transit to some other series. We have observed, for example, near the Phillips River, a specimen of a shrubby form very similar to the narrow-leaved forms of *E. occidentalis*, but the stamens are inflexed, and show an affinity to *E. redunca*." (D. 4,885.) (*Engler's Jahrb.*, XXXV, 442.)

This is figured by me at Plate 141, fig. 5, Part XXXIV, as a form of *E. redunca*, as I found the filaments inflexed like those of *E. redunca*, and for that and other reasons I removed it from *E. occidentalis* var. *oxymitra*, and constituted it a variety of the same name under *E. redunca*.

B. "*E. occidentalis* bears likewise some resemblance to *E. redunca*, notwithstanding the sectionally different position of the two species in the anthereal system, but the bark of *E. redunca* is altogether smooth and imparts on friction of its surface a white colouration (this is wrong as regards the bark; *E. accedens* is referred to, see p. 10, Part XXXIV), the flowers are smaller and seated on shorter stalklets, the lid is acutely pointed, proportionately shorter, and contracted gradually from a not dilated base, the filaments are thinner, shorter, less angular, more whitish and inflexed while in bud; the fruits are smaller and slightly contracted at the orifice, while their valves are more enclosed, the fertile seeds are smaller, and their testa of lighter colour and smooth." ("Eucalyptographia," under *E. occidentalis*.)

Let us compare Plates 140 and 141, Part XXXIV, with Plate 148 in the present Part. Mueller has contrasted the two species very carefully. Speaking generally, the opercula of *E. redunca* are long and acute, as compared with the shorter and more cylindrical opercula of *E. occidentalis*. The fruits of *E. redunca* are smaller, and, although very occasionally somewhat campanulate, that is rare. The form of *E. redunca* one usually sees is an undoubted White Gum, while *E. occidentalis* is more umbrageous, and with a roughish bark.

4. With *E. cornuta* Labill.

In other words, what are the differences between the true Yate (*E. cornuta*) and the Flat-topped Yate (*E. occidentalis*). Leaving out the Mallet or smooth-barked tree (the variety *astringens*), I have already described the appearance of the tree and bark of *E. occidentalis* and of *E. cornuta* as Part XXXIV, p. 103. An old Yate has a dark, fissured bark, reminding an easterner of an Ironbark. There is apparently more crenulation in the juvenile leaves of *E. cornuta* than in *E. occidentalis*. At the same time, there is more or less crenulation in leaves of the Cornutæ.

In *E. cornuta* the flowers are sessile or nearly so, with longer and more curved opercula, with the lower part of the fruit less campanulate, and the valves drawn out to exceptionally long points.

Bentham (B. Fl. iii, 195) states the principal characters of *E. occidentalis* thus :—

Leaves of *E. cornuta*.

Peduncles flattened.

Flowers and fruit distinctly pedicellate.

Ovary and capsule convex or conical at the top.

Fruit urceolate; valves acuminate, protruding when open.

5. With *E. platypus* Hook.

Bentham (B Fl. iii, 195) contrasts them in the following way :—

<i>platypus.</i>	<i>occidentalis.</i>
Leaves mostly orbicular. Peduncles very flat, broad, and often long. Flowers and fruit nearly sessile. Ovary and capsule with a conical top, rim of the fruit scarcely prominent. Valves acuminate, usually prominent. Fruit obovoid-truncate.	Leaves of <i>E. cornuta</i> . Peduncles flattened. Flowers and fruit distinctly pedicellate. Ovary and capsule convex or conical at the top. Valves acuminate, protruding when open. Fruit urceolate.

Following are Mueller's views :—

"The differences by which this species (*platypus*) is separated from *E. occidentalis*, consist again in the broadness of the leaves and very angular fruit calyces, further in the absence of well-developed stalklets of the flowers, larger and particularly wider fruits on still longer and broader stalks." ("Eucalyptographia," under *E. obcordata*.)

And again :—

"*E. obcordata* (*platypus*) is distinguished from *E. occidentalis* by its roundish, somewhat crenulated leaves, by the still broader and often longer general flower-stalks, also by the absence of stalklets, by the angular calyx-tube, the often dark-red filaments (only in variety *nutans*, J.H.M.), and fruits with deltoid often short-acuminate valves." ("Eucalyptographia," under *E. occidentalis*.)

E. platypus is a dense Mallee-like scrub, while *E. occidentalis* consists usually of distinct trees, although there is a scrub form in the case of that species also, the bark of the former is smooth (principally in the case of one variety), while that of the latter is sometimes smooth, sometimes rough. It is only proper to say that we are imperfectly informed at present as to the variation of bark in *E. occidentalis*. Of the few Eucalyptus barks valuable to tanning, *E. occidentalis* var. *astringens* takes the first rank, while Dr. Stoward informed me that the bark of *E. platypus* is also valuable.

Speaking generally, *E. platypus* differs from *E. occidentalis* in the small ovate leaves, in the very broad, flat peduncle, in the shorter operculum, and in the sessile, winged fruits.

It is the variety *eremophila* of *occidentalis* that comes closest to *E. platypus*. If the drawings on Plates 145 and 146 (Part XXXV) be studied and compared with those of *E. occidentalis* on Plates 148 and 149, it will be observed that—

- (a) In *E. platypus* the peduncle is long and broad, the pedicels are absent, and the calyx-tubes are more or less ribbed and notably of greater diameter than the operculum. The fruit is obovoid truncate.
- (b) In *E. occidentalis* and most of its varieties, the peduncle is long, but not broad and sometimes quite narrow, the pedicels are always present, and the calyx-tube tapers gradually into the operculum. The fruit is campanulate.

- (c) In *E. occidentalis* var. *eremophila* we have a long peduncle of medium width, the pedicels are always present, the calyx-tubes are a little ribbed, and notably of greater diameter than the operculum. The fruit is intermediate in character between that of *E. platypus* and *E. occidentalis*, but nearer the former.
- (d) There are lanceolate leaves in *E. platypus* (e.g., the Hopetoun specimens).
- (e) If we endeavour to use as characters to separate *E. platypus* and *E. occidentalis*, the presence or absence of pedicels, the comparatively increased diameter of the calyx-tube, and the shape of the fruit (truncate-obovoid or campanulate), we are on the horns of a dilemma, and all that we can say is that *E. occidentalis* var. *eremophila* is a form intermediate between *E. platypus* and *E. occidentalis*, and there will probably be differences of opinion as to which species to attach it. It indeed belongs to both.

6. With *E. spathulata* Hook.

See remarks in Part XXXV, p. 126, also see Plate 146. *E. occidentalis* is nearest to *E. spathulata* in the var. *astringens* of the former, but the two species are sharply separated by the broad juvenile foliage of *E. occidentalis*, that of *E. spathulata* being narrow. As a rule, the operculum of *E. spathulata* is shorter.

DESCRIPTION.

CLXXXIII. *E. macrandra* F.v.M.

IN Bentham's Flora Australiensis iii, 235 (1866).

FOLLOWING is the original:—

A shrub or small tree with a smooth bark. (Maxwell.)

Leaves from ovate-lanceolate to narrow-lanceolate, rarely exceeding 4 inches, very thick and smooth, the veins more numerous and more diverging than in *E. cornuta*, and the intramarginal one usually nearer the edge, but generally scarcely visible.

Peduncles rigid and flattened, mostly $\frac{1}{2}$ to 1 inch long, with 8 to 16 or even more flowers, sessile or on very short pedicels.

Calyx-tube obovoid-campanulate, usually $2\frac{1}{2}$ to 3 lines long and rather less in diameter, but in some specimens smaller.

Operculum usually above 1 inch long.

Stamens when dry yellowish, erect in the bud as in *E. cornuta*, the edge of the disc inflexed; anthers oblong, with parallel cells.

Ovary flat-topped, the style not thickened at the base.

Fruit semi-ovoid, truncate, 3 to 4 lines diameter, or in some specimens rather smaller, the rim narrow, on a level with the calyx as well as the flat-topped capsule, the small valves not protruding.

We have in *E. macrandra* not only angular filaments (as occur in most of the *Cornutæ*), but these are crinkly or bent, and in each bend is an oil-gland or a resinous mass. In filaments which are truly thread-like, where there are glands, they stand out like tubercles (*e.g.*, *E. megacarpa*, fig. 6b, Plate 78), but in the *Cornutæ*, while studding the surface of the filament, they do not appear to project beyond its outline.

SYNONYM.

E. occidentalis Endl., var. *macrandra* Maiden.

Formæ a thicket of Marlock 4-8 feet high on a slope of Gaalgugup Hill, Kalgan Plains.

Suckers bright green on both sides, ovate acuminate, apparently similar to those of *E. occidentalis*.

Branches brittle. Very long opercula, bulging a little at the top.

Fruit conoid, slightly angled, not urceolate or scarcely so, usually three valved, capitate or with very short pedicels. Tips of valves not exsert or only slightly so.

(Maiden in Journ. W. A. Nat. Hist. Soc. III, Jan. 1911.)

RANGE.

This species is, so far as we know at present, confined to Western Australia. In the original description, the range is quoted as "From the valleys south of Stirling Range to Salt River and Phillips Range."—*Maxwell*.

I have seen the following specimens :—

"Shrubs of 30 feet, bark smooth." Banks of Salt River (*Maxwell*). The type. These specimens have very long opercula, as long as those of *E. cornuta*, and small, sessile, cylindroid fruits with non-protruding valves. The fruits are, however, loose. Received from the late Mr. J. G. Luehmann, then Curator of the National Herbarium, Melbourne.

Galgugup Hill, Porongorups (*J.H.M.*). These are small shrubs, with juvenile leaves, and precisely match such of *Maxwell's* material as is available.

Red Gum Pass, Stirling Range (*Dr. A. Morrison*). Similar to *Maxwell's*, except that the fruits are four-celled.

AFFINITIES.

1. With *E. cornuta* Labill.

In B. Fl. iii, 195, *Bentham* makes a statement of the points of *E. macrandra* for comparative purposes as follows :—

Leaves of *E. cornuta*.

Peduncles flattened.

Flowers and fruit nearly sessile.

Ovary flat-topped, the style not thickened.

Fruit truncate, the valves not acuminate nor protruding.

E. cornuta is figured at Plates 142 and 143, Part XXXIV. The buds of the two species are a good deal alike, but those of *E. cornuta* are more curved. The fruits are markedly different.

2. With *E. occidentalis* Endl.

"*E. macrandra* F. v. M. is an extreme form of *E. occidentalis*, exhibiting elongated calyces on hardly any stalklets with very long stamens, and generally smaller fruits with very short fruit valves." ("Eucalyptographia," under *E. occidentalis*.)

Luehmann, as we have already seen, was also of opinion that it could not be maintained as a species distinct from *E. occidentalis*.

The plates of *E. occidentalis* are published in the present Part. The opercula of that species are shorter and more cylindrical as a general rule, the fruits stalked, larger and more campanulate.

E. occidentalis var. *astringens* is the form of the species which seems to most nearly approach *E. macrandra*, but the buds are shorter, and while the fruits are so small as to approach those of *E. macrandra* in size, they are distinctly pedicellate and have the tips of the valves distinctly exerted.

3. With *E. dumosa* A. Cunn. var. (?) *rhodophloia* Benth. (B. Fl. iii, 230).

See Part IV of the present work, with figures 1a and 1b of Plate 21.

The fruits as figured at 1a strongly resemble those of *E. macrandra* (as figured at fig. 3b, Plate 150). The opercula are very different, but, in view of the imperfect state of our knowledge of (?) var. *rhodophloia*, and even of *E. macrandra*, the affinities of the two *Eucalypts* should be borne in mind.

DESCRIPTION.

CLXXXIV. *E. salubris* F.V.M.IN *Fragmenta* X, 54 (1876).

FOLLOWING is a translation of the original description :—

A shrub.

Leaves linear or falcate lanceolate, bright, covered all over with oil-dots, veins very fine and somewhat spreading, the longitudinal ones close to the margin, umbels 4-7 flowered.

Peduncles 2-edged compressed.

Operculum conical-hemiellipsoid, obtuse, two or three times longer than the hemispherical tube and smooth like it, filaments very much broken before flowering.

Anthers oblong and dehiscing by a longitudinal aperture on either side. Between Victoria Spring and Ularing, W.A. (Young).

Branchlets rather slender and somewhat terete, sometimes hoary.

Leaves scattered, 2-4 inches long, 3-9 lines broad, distinctly petiolate, veins sunk (immerge), not very thick.

Umbels axillary, solitary and terminal, shortly paniculate.

Peduncles about $\frac{1}{2}$ inch long, 1-1 $\frac{1}{2}$ lines broad.

Pedicels 2-4 lines long, slightly angled.

Operculum about 3 lines long.

Stamens well unfolded and fruit unknown. (See below.)

In the next volume of the *Fragmenta*, viz., XI, 12, Mueller redescribed the species, making some important alterations. Following is a translation of his new description :—

A tall tree, branchlets angled at first.

Leaves scattered, lanceolate-falcate, shining on both sides, covered all over with oil dots, veins very fine, ascending at a very acute angle, both the outermost veins slightly remote from the margin.

Umbels axillary, presently lateral, few-flowered, peduncles linear-cuneate, very much compressed.

Pedicels somewhat thick, angled, almost as long as the semi-ovate calyx-tube or twice as long as it.

Operculum hemiellipsoid, very obtuse, almost twice as long as the calyx-tube, all the fertile stamens broken up before flowering.

Anthers oval-oblong, basifixed, dehiscing on both sides by a marginal cleft, connective rather broad and prominent for the whole length of the anther, stigma not broader than the style.

Fruits small, semi-ovate, 3 or more rarely 4 celled, valves short almost deltoid, sunk, fertile seeds wingless.

In hills near the source of the Swan River (Mueller) at least up to the oases of Yurindin (Forrest) Ularing, and Victoria Spring (Giles), making small forests, here and there, with *E. salmonophloia*.

A tree, as far as I have seen, reaching an altitude of 120 feet, here and there 150 feet, called by the colonists at Swan River "Fluted Gum Tree," on account of the trunk, which has some longitudinally very broad and often somewhat twisted furrows and canals. The tree is also known by the colonists by the name

of Gimlet tree. The trunk, moreover, is tall with a much branched head. Bark smooth, shining, ash-coloured, and the same time brownish or greenish, not whitish when rubbed as in *E. redunca* (*E. accedens* W.V.F. is really meant. J.H.M.).

Branchlets slender, petioles $\frac{1}{2}$ – $\frac{3}{4}$ inch long.

Leaves attaining a length of 6 inches, and a breadth of $\frac{3}{8}$ inch.

Peduncles $\frac{1}{2}$ inch long or slightly longer up to 2 lines broad.

Flowers 7 or fewer in an umbel, the tube of the flowering calyx $1\frac{1}{2}$ –2 lines long, gradually tapering into the pedicel and not angled.

Operculum smooth, shining, yellowish or brownish.

Stamens fairly numerous, anthers $\frac{1}{3}$ – $\frac{1}{2}$ line long. Pollen grains obtuse-tetrahedral, smooth, style shorter than the stamens, stigma truncate.

Fruit almost 3 lines long and broad, margin of the orifice narrow and flat, valves apiculate. Fertile seeds scarcely exceeding $\frac{1}{2}$ line. The sterile ones for the most part shorter. (See also "Affinities.")

The whole stem often twisted like a gigantic corkscrew, less like a gimlet. Gimlet saplings are thin and graceful.

Everybody now calls it "Gimlet," but an old sailor (Captain J. Lort Stokes, R.N., in his "Discoveries in Australia," ii, 133, 1846) called it "Cable Gum," and gave the native name as Gnardarup. He speaks of its trunk "like several stems twisted together, abundant in the interior."

Mueller speaks of it attaining a height of 150 feet; I would like to see this figure authenticated by a surveyor or other person accustomed to make measurements.

Mueller ("Eucalyptographia") speaks of "Branchlets sometimes with a white bloom." In *Fragm.* XI, 12, he points out that the subjacent bark is brownish or greenish, which are, indeed, the usual colours one observes in Gimlet trees. They have a peculiar olive green hard bark (reminding one of *E. stellulata* of the east a little).

Many Gimlet trees have short uniform ribbons all up the trunk; they stick out, and such gimlets are termed "feathery." I particularly noticed this on the Kurrawang wood-line.

Mr. H. G. Smith has some notes on the tanning value of this bark in the *Journal of Agriculture, W.A.*, 20th April, 1905, p. 219, as follows:—

The tannin of the "Gimlet" strongly resembles that from the "Salmon Gum" (*E. salmonophloia*) and is of very good quality. Unfortunately the bark of this species is thin. The leather tanned with it, however, would be of a light colour, and its action on hide also fairly rapid. The amount of soluble non-tannin is greater than with the barks of the other species tested, but this might be found to improve in this respect if collected at other times of the year, or in different localities. Although thin, yet the bark of the "Gimlet" may be considered of some value, and might be used with advantage by local tanners. It soon dries, and when dry readily powders, as it is not at all fibrous. It is a hard, close bark, very thin, brownish to grey externally. Much of it did not exceed two millimetres in thickness, and the thickest was only five millimetres. The thickest bark had occasionally a layer of kino. The bark is brittle and readily powders. In appearance it much resembles the "Salmon Gum," but is not so fibrous.

Total extract, air-dried bark	=	30.5	per cent.
Tannin	,,	18.6	,,
Non-tannin	,,	11.8	,,
Moisture	,,	9.7	,,

The juvenile leaves are lanceolate and glaucous. Mueller states that "The extraordinary abundance of oil in the leaves, approximately 4 per cent. in the fresh foliage, points this species out as the leading one in Western Australia for oil distillation" (*Forest Resources of W.A.*). He dwells on this in his "Eucalyptographia."

VARIETY.

Var. *glauca*, var. nov.

Trees 70 miles north of Kurrawang (J.H.M.) are wholly glaucous and with sessile inflorescence. This form is so different to the ordinary species that it seems to me to be worthy of a varietal name.

RANGE.

It is confined to Western Australia, so far as we know, but it may yet be found in western South Australia. It grows on flats and not on ridges.

The type came from between Victoria Spring and Ularing (Ularring), (*i.e.*, probably in the vicinity of the Kalgoorlie-Menzies railway line. Ularring is south of Lake Barlee and Queen Victoria Spring is north-east of Coolgardie). In the "Eucalyptographia" Mueller also quotes "From the eastern bases of the Darling Range, towards the more arid inland tracts, at least as far as Yurindin (Forrest). Speaking generally it is a native of districts of low rainfall."

The following refer to particular specimens :—

"Fluted Gum tree." Upper Swan River (Mueller). This is apparently the record nearest to Perth, and it is a pity that the precise locality was not given, as it is not found quite near to Perth.

"Bark very smooth, thin; timber pale brown, heavy, fissile, used for fencing rails and posts, also gates. Good firewood. Said to be the strongest timber. Two inches in diameter, a good straight barrel, it runs up and is not a shade tree." Goomalling. (Percy Murphy.)

Eighty feet, diameter 2 feet, stamens white. Cunderdin (W. V. Fitzgerald). Tammin (J.H.M.); Kellerberrin (F. H. Vachell).

East of York (Sayer and Carlson, from Herb. Melb.). Mueller looked upon this as a variety of *E. oleosa* with flattened stalklet.

"With a smooth light brown or greenish bark, and the trunk has deep, often twisted longitudinal grooves, 40-50 feet high." Cowcowing; near Watheroo (Max Koch, No. 988).

Nine miles north of Bullabulling (W. V. Fitzgerald), Bullabulling (Dr. F. Stoward, No. 89).

Normal form, 70 miles north of Kurrawang (J.H.M.).

Glaucous form also 70 miles north of Kurrawang (J.H.M.) Wholly glaucous and with sessile buds. I have proposed the name of variety *glauca* for this form.

"Tree of 50 feet, 18 inches diameter, stamens white." 12 miles north-east of Kanowna (W. V. Fitzgerald).

AFFINITIES.

So far as I know, the twisted stem renders this species unique, and this character need not be repeated in making the comparisons which follow.

The anthers open in parallel slits: the gland at the back extends nearly the full length; the filament is attached nearly at the base. They tend to be unique, at all events I know of no near relation, but the affinities, as indicated by the seedlings and other organs, have not yet been finally gone into.

The species is allied to many, e.g., *E. angustissima*, *E. leptopoda*, *E. oleosa*, and *E. redunca*, but is to be easily distinguished by one character or another, but in the shape of the leaves, as well as in their abundant oil-bearing glands, they are sufficiently like the narrow-leaved variety of *E. amygdalina*. (Original description.)

Let us take these species *seriatim*.

1. With *E. angustissima* F.v.M.

Species somewhat resembling *E. angustissima*, but the tall stature (although this is variable in many Eucalypts) the breadth of the leaves, the dilated flattened peduncles seen in *E. salubris*, separate it from that species. (Mueller in Fragm. XI, 13.)

For *E. angustissima* see Plate 84, Part XIX. It is a shrub, with linear leaves. The buds of the two species are a good deal alike, and these seem to present the closest resemblance, the rim of the fruit in *E. angustissima* is more domed. The anthers are different.

2. With *E. leptopoda* Benth.

For this species see Plate 73, Part XVII. The leaves of *E. leptopoda* have a greater similarity to *E. salubris* than *E. angustissima* have, but they are less shiny. The buds present differences with the round peduncles and long pedicels of *E. leptopoda*, and the buds of the latter have the operculum more pointed. The fruits of *E. leptopoda* are more tazza-like, while that species is a shrub.

3. With *E. oleosa* F.v.M.

Mueller ("Eucalyptographia") speaks of this as one of the species whose relations to *E. salubris* are not yet clearly understood. At a matter of fact herbarium specimens of the two species were and are not infrequently confused, even by Mueller, describer of both species.

"Leaves similar to those of *E. oleosa* var. *longicornis* (Morrell). (*Fragm.* XI, 13.)

E. salubris differs in the following important points—its non-broad juvenile leaves, its brown timber, its anthers. Its most important similarity is in the buds, which can be ascertained by a reference to Plate 65, Part XV, but even in those forms of *E. oleosa* which most closely resemble it in this respect, the difference in the fruit, with the long tips of the capsules, is sharp.

4. With *E. redunca* Schauer.

"The umbel-stalks and fruits are not dissimilar to those of *E. redunca* "Eucalyptographia" under *E. salubris*.)

"Pedicels and fruit not dissimilar to those of *E. redunca*." (*Fragm.* XI, 13.)

The drawings of *E. redunca* on Plate 140, Part XXXIV, may be referred to. With reference to the points noted by Mueller, the timber of *E. salubris* is brown, but may also be of a reddish brown. It is tough and hard, and not very dissimilar in general appearance to that of *E. redunca*, which has also a brown timber. *E. redunca* is a denizen of swamps chiefly in the south-western part of the State; *E. salubris* is a native of the drier parts of the State. The operculum of *E. rudis* is attenuated.

The trunk of *E. salubris* is very different to that of *E. redunca*.

5. With *E. spathulata* Hooker (*occidentalis* var., *spathulata*).

" The operculum however almost of *E. spathulata*. but more obtuse" (Mueller, in *Fragm.* XI, 13). And again, "The lid resembles that of *E. spathulata* ("Eucalyptographia," under *E. salubris*).

Compare the drawings of *E. spathulata* in Part XXXV of the present work. The foliage of *E. spathulata* is nearly linear in the type, lanceolate, and certainly much broader in *E. salubris*. The opercula are, at all events in the type, more cylindroid in *E. spathulata*. The leaves of *E. spathulata* are less rich in oil. In instituting comparisons it will of course be understood that our knowledge of *E. spathulata* in the field is very imperfect.

DESCRIPTION.

CLXXXV. *E. cladocalyx* F.v.M.IN *Linnaea* XV, 388 (1852).

FOLLOWING is a translation :—

Shrubby, branchlets angular.

Leaves alternate, coriaceous, elongated-lanceolate, gradually acuminate, slightly curved, pale green, shining, faintly nerved and veined, the same colour on both sides, impunctate, with a thin margin.

Umbels pedunculate, lateral, crowded, five to ten flowered.

Buds claviform.

Calyx-tube finely campanulate, gradually tapering into a somewhat shorter pedicel, angles obsolete, exceeding three or four times in length the depressed hemispherical thin smooth awnless operculum.

Fruit urceolate-ovate, costate.

Collected by C. Wilhemi at the base of the Marble Range.

Among those of this colony (South Australia) it is most like *E. fasciculosa*.

A strong dense shrub, 7-8 feet high.

Leaves 3-4 inches long, 1 inch broader or narrower towards the base, slightly shiny, for the most part reddish near the margins and mid-vein, more often with a thick uncinat, terminal point.

The umbels when the leaves are shed are lateral, sometimes paniculate.

Peduncles $\frac{1}{2}$ inch and more long, somewhat smooth, spreading, seldom reflexed.

Flowers with the pedicels 8-9 lines long; the calyx-tube drying corrugated, slightly contracted near the middle, a little enlarged at the apex, here with a diameter of 3 lines.

Stamens whitish, as long as the calyx-tube.

Fruits $\frac{1}{2}$ inch long, contracted at the mouth, unequally costate. Valves deeply immersed. Flowering in spring and summer.

Then Miquel, on Mueller's behalf, again described *E. cladocalyx* F.v.M., in Latin in *Ned. Kruidek. Archief*. IV, 135, published in the year 1856. The only addition to the original description is the statement that it somewhat resembles *E. obtusiflora*.

In Walpers' *Annales botanices systematicæ* IV, 825 (1857), it is for the third time described (by C. Mueller now) as *E. cladocalyx*. The description is based on the original description.

Mueller (the original describer) then redescribed the species under the name of *E. corynocalyx* in Vol. ii, page 43, of his *Fragmenta* (1860), still referring to the species as shrubby. He did not, however, mention that the species had already been thrice described under the name of *E. cladocalyx*; indeed, he omits that name altogether, and leads one to assume (from the references given to difficultly accessible works), that the species *corynocalyx* had been described at the date of the earliest of the references, viz., 1852.

On a *corynocalyx* label in the Melbourne Herbarium in Mueller's handwriting appear the words "called by a clerical error in the manuscript *E. cladocalyx* in the

Linnaea." The word *cladocalyx* is from *klados* a branch; *corynocalyx* means club-shaped calyx (or bud or fruit). "The specific name is derived from the calyx, somewhat club-shaped while in its unexpanded state ("Eucalyptographia").

No doubt *corynocalyx* is more descriptive than *cladocalyx*, but the fact that an inappropriate name was given by a "clerical error" cannot be permitted to add to the confusion. Let us get to a firmly based nomenclature as soon as we can, for countless botanists will follow us, and it is for them we are building as well as for our contemporaries.

Bentham, B. Fl. iii, accepted *E. corynocalyx* without comment, and Mueller ("Eucalyptographia") adopts his own second name, *E. corynocalyx*. The species is figured by Mr. J. Ednie Brown in his "Forest Flora of South Australia."

The name "Sugar Gum" has been applied to this tree (I do not know by whom originally, although it first came into use at Wirrabara Forest, S.A., as Mr. Walter Gill told me, but certainly Mr. J. Ednie Brown made it popular), because the foliage is eaten by stock, and Mr. Brown quoted *E. Gunnii* as possessing similar properties. At the same time, in the "Forest Flora of South Australia," in which he made the statement, the tree he figured as *E. Gunnii* Hook f., is *E. ovata* Labill.

Mr. J. E. Brown, in evidence before the Victorian Vegetable Products Commission, 1889, calls this the most valuable of South Australian timbers, and (in that State) just as rapid of growth as *E. globulus*, the timber more durable and valuable than that of *E. rostrata*, and capable of resisting the white ant better than *E. marginata*. It grows particularly well on limestone country, and is one of the most ornamental of South Australian Gums. Mr. Brown showed trees at four years about 20 feet high; they were planted out when about 4 inches high. While undoubtedly a valuable South Australian timber, it may be that the comparisons with other timbers may require revision.

SYNONYM.

E. corynocalyx F.v.M. in *Fragm.* ii, 43 (1860).

Following is a translation of the original description :—

A shrub, leaves alternate, with rather long petioles, long, more rarely ovate-lanceolate, slightly curved, gradually narrowed into an acuminate apex, finely spreading-penniveined, reticulately veined, imperforate, paler underneath, peripheral vein rather distant from the margin.

Umbels solitary, axillary, finally lateral, 5-16 flowered.

Peduncle rather terete, longer than the pedicels.

Buds pyriform-clavate.

Calyx-tube thin-campanulate, three or more times longer than the depressed-hemispherical non-pointed or apiculate operculum.

Anthers minute, sub-ovate.

Fruits ellipsoid-urceolate, three-celled, finally wrinkled-costate, margin of the vertex thin, valves included, seeds winged.

In the desert round the Marble Range mountains between Spencer's Gulf and Coffin Bay (*Wilhelmi*).

A rather tall, handsome shrub. Branches slender, angled, then terete, flexible.

Leaves for the most part $2\frac{1}{2}$ –4 inches long, $\frac{3}{4}$ – $1\frac{1}{2}$ inches broad, younger ones sometimes broader; on the upper side in the fresh state at least rather saturated green, on the under side pale green, shining on both sides.

Peduncles $\frac{1}{2}$ –1 inch long.

Flower-bearing pedicels up to 2 lines long, fruit-bearing ones sometimes measuring up to 6 lines.

Opened buds 4–6 lines long, often pale.

Opereulum about 2 lines broad.

Calyx-tube at least in the dry state wrinkled-striate.

The longer filaments scarcely more than $\frac{1}{4}$ inch.

Anthers about $\frac{1}{4}$ line long, broader at the top, almost truncate.

Style almost semi-exsert from the calyx, about 2 lines long.

Fruit 5–7 lines long, 3–4 lines thick, contracted at the mouth to about a line and a half, in the drying and when hard, furrowed sterile seeds $\frac{3}{4}$ – $\frac{1}{2}$ line long, more or less rhomboid or tetrahedous; fertile seeds few, ovate, scarcely longer than 1 line, in the specimens we have received dirty looking and pale.

It is related to *E. urnigera*, the alpine species, which sometimes is a shrub and sometimes a tree up to 50 feet high, and in the section of *Leipholoia*, because the floral characteristics are very similar; it differs in the imperforate somewhat discoloured leaves, the not distinctly wrinkled-striate calyx-tube and perhaps in the important marks of the fruit which have been already stated.

Miquel compares the species to *E. obtusiflora*. The species also somewhat resembles *E. gomphocephala*.

RANGE.

It is mainly confined to South Australia. Mueller ("Eucalyptographia") gives the range as "Along Spencer's Gulf in many places; thence dispersed westward at least as far as Streaky Bay (Colonel Warburton); on the stony declivities of Mount Remarkable and at Wirrabara, ascending to considerable elevations (J. E. Brown); about the lower Wimmera (J. Allen)." The Wimmera is a Victorian river, and the lower Wimmera would be, I suppose, say between Dimboola and Lake Hindmarsh. I have personally never seen any indigenous specimens from Victoria, and in view of the fact that it is a commonly cultivated tree, one should verify reputed Victorian localities for it as an indigenous plant.

The late J. Ednie Brown, in his "Forest Flora of South Australia," says that "Its principal home is on the summits, slopes, and foothills of the Flinders Range, lying between Crystal Brook in the south and Mount Brown and Devil's Peak on the north. In the somewhat extensive range of country within the boundaries named, the trees are most numerous in that portion known as the Wirrabara Forest Reserve, where they can be seen in all their grandeur of growth. . . . On Eyre Peninsula, from within a few miles westward of Port Lincoln in the Marble Ranges, the species forms a very considerable proportion of the forest growth; there it is of rather a depressed or dwarfed form, when compared with the stately trees . . . on the Flinders Range."

He goes on to say that Professor Tate first found it on Kangaroo Island, and that Professor Tate and he found it to be the largest timber tree on the island, and apparently confined to the banks of rivers and creeks.

Following are some notes I made in regard to the species in the field, at no great distance from the type locality.

I studied this species pretty carefully from Port Lincoln to Lake Wangary, where, however, the most valuable trees do not grow (the type, however, comes from the Marble Range, close by Lake Wangary). It is, in this district, an inferior species, and the warning is not inappropriate that seed collected from localities such as this will produce inferior trees. It is a White Gum, more or less scaly-barked like the eastern *haemastoma*. Rather straggling and spreading, a good head of dark-coloured, rather broadish, shiny foliage. Timber whitish, hence "White Gum"; looked upon locally as inferior to Red (*leucoxydon*). "White Ants go through it," I was informed locally. At 7-8 miles from Port Lincoln (old road); it often has the grey bark of one of the New South Wales Grey Gums (*punctata*). Timber pale, but slightly brown in the middle. Abundant at 11 miles. It often sheds the greyish outer bark, and then becomes smooth brown all over like the eastern *Angophora lanceolata*. At 12-14 miles we have an association between it and *Xanthorrhæa semiplana*. The *cladocalyx* does not impress me here. It reminds me of *Angophora lanceolata* in its goutiness and gnarledness. It has a thick, sappy bark of a rich orange colour. I also collected the species at Port Augusta. (*Proc. Roy. Soc., S.A.*, XXXII, 278 (1908).)

E. cladocalyx, under the name of "Sugar Gum," has been so extensively planted in Australia, particularly in other parts of South Australia, and also in Western Australia, Victoria, and New South Wales, and to a less extent in Queensland, that one must be careful in recording a cultivated plant as indigenous.

In New South Wales we find it a very useful tree for shade and ornamental purposes in the drier parts of the State, in spite of the fact that in a number of cases it has developed a tendency to brittleness of its large branches, which is, of course very undesirable, particularly in towns.

AFFINITIES.

"The shape of the unopened calyx distinguishes *E. corynocalyx* from any other species hitherto known." ("Eucalyptographia").

Mr. Walter Gill points out that the flutings (on the fruit) are not noticeable on cultivated specimens; certainly they may be reduced in prominence.

1. With *E. fasciculosa* F.v.M.

"Among those of this colony (South Australia) it is most like *E. fasciculosa*" (original description).

For *E. fasciculosa* see Plate 61, Part XIV, of the present work. *E. fasciculosa* has red timber, different shaped buds and fruits (without striae), while its anthers have terminal pores.

2. With *E. obtusiflora* DC.

In the 1856 description of *E. cladocalyx* already referred to is the statement that it somewhat resembles *E. obtusiflora*. This is an unfortunate suggestion, but it was made over 60 years ago.

E. obtusiflora belongs to the Renantheræ, and is figured at Plate 43, Part X.

3. With *E. urnigera* Hook f.

"It is related to *E. urnigera*, . . . in the section of Leiophoix, because the floral characteristics are very similar; it differs in the imperforate, somewhat discoloured leaves, the not distinctly wrinkled-striate calyx-tube, and perhaps in the important marks of the fruit." (Original description of *E. corynocalyx*.)

Mueller again refers to the comparison in the following passage:—

"The nearest affinity is with *E. urnigera*, which species is, however, strictly confined to the alpine regions of Tasmania, and probably never attains a height of over 50 feet; moreover, the leaves of the latter are of equal green on both sides, and copiously beset with pellucid oil-glands, nor is the tube of the calyx wrinkled or streaked." ("Eucalyptographia," under *E. corynocalyx*.)

Compare Plate 80, Part XVIII, of the present work. The similarities of the two species are in the general outline (not in the sculpture) of the buds. The shapes of the fruits are very different; the anthers are different.

4. With *E. gomphocephala* DC.

Mueller, in the original description of *E. corynocalyx*, says "The species also somewhat resembles *E. gomphocephala*." See Plate 92, Part XXI. The only obvious resemblance is the operculum of increased diameter, which is very much more exaggerated in *E. gomphocephala*. The timbers of both species are pale; that is the only other resemblance which occurs to me at present. The bark of *E. gomphocephala* is woolly; that of *E. cladocalyx* (*corynocalyx*) is a gum.

5. With *E. phoenicea* F.v.M.

Compare Plate 96, Part XXII. There is a general resemblance in buds, and even in fruits, but *E. phoenicea* is a tropical species, with a flaky (micaceous) bark, crimson filaments and a two-celled ovary. There appears to be no close relation.

6. With *E. torquata* Luehmann.

Compare figures 6a to c, Plate 13 of Part IV. The buds are very different in shape in the two species, but there is ribbing in both buds and fruits, very much intensified in *E. torquata*.

The anthers of *E. cladocalyx* have some resemblance to those of *E. torquata*. The filaments are pink or crimson in the latter species, which is rough-barked, and the relations of the two species do not appear to be close.

7. With *E. Cooperiana* F.v.M.

The affinity with this species is dealt with at p. 168.

DESCRIPTION.

CLXXXVI. *E. Cooperiana* F.v.M.IN *Fragmenta* XI, 83 (1880).

FOLLOWING is a translation of the original:—

Branchlets acute-angled.

Leaves scattered, coriaceous, ovate-lanceolate, the same colour on both sides, shining, imperforate, lateral veins pinnate-spreading, many and faint, marginal vein distant from the edge.

Umbels axillary, solitary, hanging down or nodding, many-flowered, placed on a peduncle somewhat broadly compressed.

Pedicels rather thick, angled, almost the same length as the calyx.

Calyx-tube shortly cylindrical, very obtuse at the somewhat swollen base, almost three times as long as the patella shaped or depressed hemispherical operculum.

All the stamens fertile, inflexed before expansion, anthers basifixed, cordate-globose, dehiscing on both sides by a large pore, stigma scarcely thicker than the style.

Capsule deeply included, five-celled, with a flat-top.

In South West Australia, but no locality stated. (Maxwell.)

The height of this species is entirely unknown to me. Branchlets thick, rigid, compressed, tetraginous.

Leaves with somewhat long petioles, rigid, $2\frac{1}{2}$ –4 inches long, $\frac{3}{4}$ –1 $\frac{1}{2}$ inches broad, not very inequilateral, obtuse at the base, near the apex gradually acute, the point rather blunt; oil-glands hidden.

Peduncles before flowering about $\frac{2}{3}$ inch long, petioles a little or conspicuously shorter, 1–1 $\frac{1}{2}$ lines broad, broadly dilated at the base.

Flowers 17 in the umbel or fewer.

Pedicels thickened towards the top.

Calyx-tube 2–4 lines long, slightly cubical or prismatic, when drying slightly obtuse angled and folded.

Operculum two or here and there three times broader than high, very obtuse and shortly apiculate, slightly rugulose.

Stamens inflexed before expansion, but not bent at an acute angle. A few of the anthers sometimes turn into an almost renate form; the connective near the apex at the back, thickened with a swelling gland.

Style shortly exsert.

Calyx-tube soon after the fall of the stamens not thickened, perhaps at the margin permanently very much compressed, but in the fruiting stage not known to me.

(Then follow observations in regard to certain allied species. See below, p. 168).

I have given the name of Ellwood Cooper to this species; he is a distinguished promoter of Eucalyptus cultivation in California, founder of the Santa Barbara College, and who, besides many pamphlets, published "Forest Culture and Eucalyptus Trees" (San Francisco, 1876).

RANGE.

In the original description, at *Fragm.* XI, 84, it is stated to have been obtained from South Western Australia by Maxwell, but that the precise locality was unknown. Maxwell's headquarters were Albany, and he collected not many miles north of the south coast. He did not go far west of King George's Sound, but collected in the Stirling Range, and east towards the Great Bight, but I do not know how far east. Mueller did not always demand or obtain precise localities from his collectors, and in the case of large collections he very often contented himself with labelling the plant with a vague locality such as "South West Australia" (as in this case), and the date, which might have furnished a clue, was very often omitted. He often did this to save his own time, trusting to his own excellent memory, and very often the precise locality, though always desirable, did not much matter, as it has done in the case of the present species. The material is incomplete, the locality and date are wanting, and they happen to be badly required now. I suggest that the material on which this particular species was founded was received by Mueller with other odds and ends, imperfectly labelled, amongst Maxwell's effects, soon after his death at Middleton Beach, Albany, in January, 1880.

AFFINITIES.

1. With *E. Flocktoniae* Maiden.

Only leaves and flowers (with buds) of *E. Cooperiana* are in existence (see figure 5, Plate 15); fruits were never seen by Mueller, and therefore one must proceed with caution. Some not perfectly ripe fruits (which perhaps belong to *E. Flocktoniae*), have since been attributed to *E. Cooperiana*, but they are, I think, not free from doubt. I hope, therefore, that the publication of the figures, and of the present statement, will set collectors to work, and material will be rendered available to decide what *E. Cooperiana* really is. For drawings of *E. Flocktoniae* see Plate 69, Part XVI.

"It is nearer to *E. Flocktoniae*, from which it differs in the broad peduncles and pedicels, the broader leaves and the operculum, which is long in *E. Flocktoniae*. At the same time it is a species which requires further investigation.

"Although Mueller said he had not seen it in fruit, I have received from Professor Ewart a small twig bearing two not fully developed fruits, which certainly bear some general resemblance to those of *E. Flocktoniae*." (See Maiden in *Journ. Roy. Soc., N.S.W.*, XLIX, 327, 1915).

2. With *E. decurva* F.v.M.

"Bentham places this species with *E. decurva*, from which it is distinguished by thicker somewhat angular branches, more rigid, longer and stronger leaves, petiolate, never opposite, but broader, paler green, less falcate and less inequilateral, veins more conspicuous, the network of the veins, however, less visible, umbels more richly flowering, peduncles and pedicels remarkably thicker, operculum more depressed, calyx-tube somewhat wrinkled and almost truncate at the base, anthers neither dorsifixed nor oblong-ovate, nor dehiscing longitudinally through a double orifice, perhaps also in the character of the fruits; it hardly belongs therefore to the *Parallelantheræ*" (Original description).

The references to *E. decurva* may be better understood by reference to Part XVI, p. 186, and also to the account of *E. decurva*, pp. 191 *et seq.* If, however, the figures of *E. decurva*, Plate 70, be turned to, it will be seen that the two species are separated by the shape and sculpture of the buds. One cannot push the comparison very far, in view of the paucity of the material of *E. Cooperiana*.

3. With *E. cladocalyx* F.v.M.

"*E. Cooperiana* agrees somewhat with *E. corynocalyx* (*cladocalyx*), although this also belongs to the *Parallelantheræ*, as I have already shown in 'Eucalyptographia,' Decade 2. The branches of this, however, are thinner and not very much angled; the leaves are narrower and more plainly curved, somewhat paler on the underside, of a thinner consistency; the peripheral vein is closer to the margin of the leaf; the peduncles are thinner, scarcely compressed, not properly axillary; the flowers are often fewer in the umbels, more thinly pedicellate; the calyx is thinner, not conspicuously plicate under the flower, not suddenly obtuse at the base and not turgid, anthers oblong-oval, with parallel slits, fruits to be compared after those of *E. Cooperiana* have been found. From these marks there is shown the close affinity to *E. decurva* and *E. corynocalyx*, although the pedicels are longer and more slender, the calyces are thicker towards the middle, the operculum with a slightly longer point, the anthers not fixed at the base, but versatile, fruit thicker and not striate." (Original description.)

Always bearing in mind that the authentic material of *E. Cooperiana* is very imperfect, it would appear that *E. cladocalyx* is distinct from *E. Cooperiana*. The anthers place the latter in a different section; they are somewhat like those of *E. torquata*. The buds of the two species seem to possess some differences; the fruits of *E. Cooperiana* must be searched for.

4. With *E. concolor* Schauer.

"*E. concolor* is closely approximate to *E. Cooperiana* on account of its strong angular branches, compressed peduncles, form and structure of the leaves and anthers; it differs, however, in having the peripheral very close to the margin of the leaf, in the almost complete absence of pedicels, the operculum almost the same or a little longer than the semi-ovate hemi-ellipsoid or conical calyx-tube. The style, however, is longer and finally the fruits have to be compared. *E. concolor*, as Maxwell shows, extends to Cape Arid." (Original description.)

The figures of *E. concolor* on Plate 63, Part XIV, may be referred to.

DESCRIPTION.

CLXXXVII. *E. intertexta* R. T. Baker.

IN *Proc. Linn. Soc., N.S.W.*, XXV, 308 (1900) with a Plate.

A large tree, up to 80 feet high, and 3 feet or more in diameter.

Bark smooth nearly to the ground; butt-bark hard and persistent, extending a few feet up the trunk; the smooth bark has patches or spots, and varies much in colour, from a brownish or all shades of a lighter gray, to sometimes quite chalky white.

Young or sucker leaves similar in shape to mature ones, but at times somewhat broader.

Mature leaves lanceolate-acuminate, mostly under 6 inches long, of a pale yellowish, or sometimes bluish colour on both surfaces, not shining: lateral veins spreading, but not prominent, and almost quite hidden: intramarginal vein close to the edge.

Buds on slender pedicels from 4-6 lines long.

Flowers numerous, mostly in a terminal panicle.

Calyx small, pyriform.

Operculum hemispherical or conical, sometimes shortly acuminate. Ovary flat-topped.

Anthers all fertile, cells opening by terminal pores.

Fruits variable in shape, sometimes cylindrical, with the thin rim incurved, whilst at other times pilular in form with a constriction below the rim, 2-3 lines long as well as broad. (Original description.)

For "Anthers all fertile, cells opening by terminal pores," at p. 309 of the original description, the following should, in my view, be substituted:—

The anthers open in parallel slits, with the gland at the top. The filament being at the extreme base sometimes gives them, in the dried specimens, the appearance of being terminal pored anthers.

Mr. Baker's figure of the buds shows the opercula to be about half the length of the calyx-tube and to diminish from the junction of the calyx-tube. This latter character is observable in all species which have a double operculum to each bud—a character more common than was at one time supposed.

When the buds are small, with a double operculum on every bud, the appearance may be that as suggested in Mr. Baker's figure, but only under those circumstances.

Mr. R. W. Peacock, who, at Coolabah, N.S.W., had the tree all round him, called it a Coolabah, and it is one of three trees which are candidates for the honour of giving the name to the township. He also called it a Red Box, being of the class of Boxes, including the smoother barked forms of *E. polyanthemos* and *E. melliodora*.

It is sometimes called White Gum; at the same time it should be borne in mind that it is always blotched, and sometimes has rough bark up to 20 feet from the ground. The upper part of the trunk and the limbs are smooth. The sap-wood is very thin, and the timber is red. The foliage is dull.

I do not find the mature leaves with the intramarginal vein so far removed from the edge as in the drawings of the type; in all the specimens accessible to me (and I have an excellent series) they are quite close to the edge.

RANGE.

No type is quoted for this species, but the following are New South Wales localities:—Dubbo to the Darling River ("Gum," W. Baeuerlen); Nymagee, Condobolin ("Coolabah"); Mt. Hope ("Yellow Jacket" and "Gum"); Cobar ("Coolabah Gum"); Drysdale ("Coolabah"); Bobadah, 30 miles east of Nymagee, one of the most easterly localities for the species.

I proceed to show that, in addition to New South Wales, it extends to South Australia and the Northern Territory, and also to Western Australia. It is a denizen of regions of low rainfall, and its recorded range may be roughly defined as central interior New South Wales as far east as Dubbo and Condobolin. It does not appear to have been collected west of the Darling, though that is only a matter of time. Then, in South Australia it occurs from the Murray to well into the Northern Territory. Coming south again, the Elder Expedition collected it in the Cavenagh Range, adjacent to South Australian localities. As it has been confused with other species (principally *E. bicolor* A. Cunn.) I confidently expect that many new localities for it will be ascertained, now that we know more about it.

NEW SOUTH WALES.

"Yellow or Spotted Gum," Gunbar, Hay district (W. Baeuerlen). Specimen given to me by Mr. Baker as fairly representing the species.

"Coolabah," Wilgaroon, 50 miles south of Bourke (R. H. Cambage); Byrock (J. L. Boorman); Coolabah (R. N. Peacock, J. L. Boorman, H. Kelly, J.H.M.). Tree itself called "Coolabah" by Mr. Peacock. "Medium to tall trees of 30-50 feet. The stems are of a scaly nature, with a yellowish cast on the permanent bark, the whole tree generally being of a silvery lustre. Clean stems, without branches, for a considerable distance from the ground. Reminds me of *E. melliodora* somewhat." Narrow suckers. Girilambone (J. L. Boorman). Cobar (J. L. Boorman); Wong Suey's garden, Cobar, very floriferous this, 1911, season (L. Abrahams). Mount Boppy (Henry Deane, J. L. Boorman). Canbelego. "A mining manager told me that he

finds it the most lasting timber for mining purposes, but the timber-getters fight shy of it because it is so hard and blunts their tools in no time" (W. Baeuerlen). "Red Gum," Nymagee (Dr. H. Wharton Cox, J. L. Boorman). Eremeran, 30 miles south of Nymagee (R. H. Cambage).

"At 16 miles a new Eucalypt with pale leaves appears, and continues practically the whole way to Condobolin, crossing to the south of the Lachlan. It is known variously as 'Gum,' 'Coolabah,' 'Yellow Box,' 'Red Box,' 'Bastard Box,' and is one of the largest trees in the west. It gets its name of Gum from its upper bark on the trunk, and branches being white and smooth, while the lower is light brown and flaky, but the hardness of the wood, which is red and difficult to split, proclaims its affinity to the Box trees." (R. H. Cambage, in *Proc. Linn. Soc., N.S.W.*, 597, 1900.)

Then we have three specimens, of which only imperfect material has been preserved. They probably both belong to *E. intertexta*, but the material is strongly reminiscent of *E. bicolor*.

Double Peak, a few miles north of Mount Hope, and west of Euabalong (R. H. Cambage). Euabalong (J. L. Boorman). "Smooth bark" (this, of course, would not apply to *E. bicolor*), Lake Cudgellico (Rev. J. W. Dwyer, No. 826).

SOUTH AUSTRALIA.

"Bastard Red Gum," Murray Desert (G. Day). In Herb. Melb. as *E. bicolor* A. Cunn. This is not far from the Victorian border, and I expect to find it recorded from the Mallee district of Victoria. It is the most southerly locality in South Australia known to me, and connects with the New South Wales ones.

Tree of 20-30 feet, 20-25 miles east of Hawker (Walter Gill).

"Resembles Red Gum (*E. rostrata*) very much in its general appearance at a distance, so that it might easily be taken for it, but a closer inspection shows botanical differences. It grows a fairly big tree, but from what I hear, its timber, though dull red, rather like Red Gum, is much inferior to Red Gum. It is called a 'Bastard Gum,' the usual fate of an unknown Gum." Bolla Bollana, Umberatana, Flinders Ranges (W. Gill). This locality is about 80 miles east of Farina.

Verbally Mr. Gill says, "Tree looks just like a Red Gum (*E. rostrata*), but timber paler and no good in ground." The value of *E. intertexta* timber should be further inquired into. In making comparisons with the timber of *E. rostrata*, it should be borne in mind that it is a well ascertained fact that in tropical regions its timber is inferior; this may apply to the timber of *E. intertexta*.

The following specimens were collected by the Elder Exploring Expedition:—

1. Mount Illbillie, the highest point in the Everard Ranges, whence the Expedition started, going west, say lat. 27 deg. (R. Helms, 5th June, 1891). As *E. largiflorens* in *Proc. Roy. Soc., S.A.*, XVI, 358.
2. South of Camp 4 (R. Helms, 11th June, 1891). This is near Mount Bonibonyana.
3. Camp 17. This is a little west of Mount Watson (R. Helms, 10th July, 1891). Labelled *E. paniculata* by Prof. Tate.

NORTHERN TERRITORY.

Gosse's Range (Revs. Schwarz and Schulze, in Herb. Melb.). Labelled *E. largiflorens* F.v.M. by Mueller.

The following were collected by G. F. Hill, going northwards :—

- No. 116. Jay Creek and Hugh River. "Grows along water courses; white stems with brownish yellow marks, large tree." In bud, flower and very early fruit.
- No. 355. 90 miles north, $\frac{1}{2}$ west of Camp 3, 15th June, 1911. "Trees and scrubs in desert. White bark with grey patches. Perhaps the desert form of No. 116." In fruit only.

WESTERN AUSTRALIA.

We now return to the collections of the Elder Exploring Expedition, made at no great distance from those indicated under South Australia :—

1. Cavenagh Range (R. Helms, 27th July, 1891).
2. Mount Cooper, Cavenagh Range (R. Helms, 31st July, 1891). Labelled variously *E. dumosa* and "*E. Oldfieldii* F.v.M., a dwarf state at 2,500 feet elevation," by Mueller and Tate.

The above specimens were collected approximately in 26 deg. S. lat. and 128 deg. E. Long.

AFFINITIES.

1. With *E. fasciculosa* F.v.M.

The unsatisfactory description of the anthers of *E. intertexta* largely contributed to my confusing these two species; the anthers of *E. fasciculosa* have terminal pores. If my reader will turn to Part XIV, p. 140, and Plate 61, he will see that in the bark, timber and fruit there is a good deal of similarity between the two species, and the principal and most practical distinction between them lies in the anthers. If this breaks down, then *E. intertexta* cannot stand. Differences will probably be found in the width of the juvenile leaves, and perhaps in the greater tendency of the young operculum of *E. intertexta* to be of diminished diameter, because of a deciduous second or outer operculum. Local observers in South Australia should set themselves to devise absolutely suitable field notes to separate the two species.

The confusion of this species by Schlechtendal and Mueller with *E. paniculata* (an Ironbark) arises out of the confusion of *E. fasciculosa* with *E. paniculata*.

2. With *E. bicolor* A. Cunn. (*E. largiflorens* F.v.M.).

Mr. Baker states the differences as—

“(1) In the inflorescence being mostly in terminal panicles; (2) the shape and venation of the leaves, *i.e.*, the intramarginal veins being only slightly removed from the edge, and the lateral veins being less prominent; (3) the shape and size of the fruits; (4) timber; (5) oil; and (6) bark.

“The bark and timber are in colour and texture so different that they alone distinguish it from *E. largiflorens*.” (*Proc. Linn. Soc., N.S.W.*, Vol. XXV, 311 (1900).

Undoubtedly herbarium specimens of the two species may be much alike (Mueller often confused them), but the two trees are very different, *E. bicolor* having a more or less fibrous bark, a pendulous habit, with narrower leaves and a browner timber. In *E. intertexta* there is an absence of the intramarginal vein, which is present in *E. bicolor*.

3. With *E. Dawsoni* R. T. Baker and *E. polyanthemos* Schauer.

Mr. Baker's remarks are, “The similarity of bark and timber, and the shape and venation of the leaves, lead me to place it in sequence next to *E. Dawsoni*, R.T.B., but the fruits and constituents of the oil differentiate it from ‘Slaty Gum,’ *E. Dawsoni*, and from *E. polyanthemos* Schau., although in some features it resembles this latter species, especially the anthers.”

The anthers sharply separate *E. Dawsoni* and *E. polyanthemos* from *E. intertexta*, and probably so also do the juvenile leaves.

4. With *E. accedens* W. V. Fitzgerald.

The two species are certainly allied in habit, in bark, timber, and shape of fruit. Compare Plates 141 and 142 (Part XXXIV). The principal difference between them lies in coarse juvenile foliage of *E. accedens*. It is often the case that, in comparing one species with another, the deficiency of material compels us to compare the same organ in two or more species in varying degrees of maturity.

DESCRIPTION.

CLXXXVIII. E. confluens (W. V. Fitzgerald) Maiden.

IN *Proc. Roy. Soc., N.S.W.*, XLIX, 317 (1915).

Folias maturas solum, alabastros non perfecte maturos et fructus habemus, sed planta a specie descripta quaque differe videtur. Arbor ramulis teretibus, apicibus paullo angulatis. Folis maturis utrinque nitentibus, angusto-lanceolatis, subfalcatis, petiolatis, petiolis circa 2 cm. longis, lamina circa 1 dm. longa et plerumque 1 cm. lata. Venis obscuris. Alabastris circa 8 mm. longis, operculo cupulaque sub-conicis et fere symmetricis. Staminis inversis, antheris paralleliter dehiscentibus, dorso glandula. Fructibus turbinatis v. conoideis, sessilibus vel pedicello circa 1 mm., pedunculo communi minore 1 cm., usque ad 7 capitulo, circa 5 cm. longis latisque.

The available material of this plant is very scanty, consisting of mature leaves, with nearly ripe fruits attached, and a few not perfectly ripe buds picked up from the ground. It is a tree. In spite of the paucity of the material, I have, after careful consideration, come to the conclusion that Mr. Fitzgerald's view that it is undescribed is a correct one. Ampler material will be available some day.

Branchlets round, slightly angular at the tips.

Mature leaves.—Pale-coloured, shiny on both sides, narrow-lanceolate, slightly falcate, petiolate, petioles about 2 cm. and laminae about 1 dm., with an average width of about 1 cm. Venation very faint, the lateral veins very slender, attached to the midrib at about 60 degrees, the intramarginal vein close to the edge.

Flowers.—Buds about 8 mm. long, nearly symmetrical as regards the calyx-tube and operculum, both of which are sub-conical. There is sometimes a pedicel of 1 mm. The rim between calyx-tube and operculum is well defined. Stamens inverted, the anthers opening in parallel slits, gland at the back, filament attached not quite half way up.

Fruits.—Turbinate or conoid, not seen quite ripe, sessile or with a pedicel of about 1 mm., on a common peduncle of under 1 cm., up to 7 in the head, about 5 cm. long and the same in breadth. a well-defined narrow rim, slightly domed, tips of valves protruded beyond the orifice, and, when ripe, they will doubtless be well exerted. (Original description.)

The description as given stands, but Mr. Fitzgerald handed me certain MSS. on his leaving for active service in April, 1916, and the following description, found amongst these papers, supplements the 1915 description somewhat.

“Arborescent; leaves alternate or scattered, linear to linear-lanceolate, straight or falcate, acuminate, obtuse, on slender petioles, rather thick, green and shining, the veins ascending but much concealed, intramarginal one confluent with the edge; flowers 4–6 together, shortly pedicellate and forming axillary umbels on slender terete peduncles; calyx-tube obconical, tapering rather abruptly into the very short pedicel; lid conical, obtuse, shorter than the tube; stamens inflexed in the bud; anthers oblong-ovate, with distinct parallel cells dehiscing longitudinally; ovary conical, style short; fruit subglobose-truncate, not constricted at the summit, the rim not thick, conspicuously raised above the calyx-border and projecting towards the centre of the cavity; capsule sunk; valves 3, broadly triangular, more or less exerted; fertile seeds, wingless, minutely pitted, the sterile ones angular and many times smaller.

"Height about 30 feet, trunk to 15 feet, diameter to 1 foot; bark persistent, white and smooth, timber brownish-red to red, very hard and extremely tough. Leaves about 4 inches long, petioles $\frac{1}{2}$ - $\frac{3}{4}$ inch. Peduncles $\frac{1}{2}$ - $\frac{3}{4}$ inch. Calyx-tube 2-2 $\frac{1}{2}$ lines long. Stamens 1 $\frac{1}{2}$ -2 lines, the filaments white. Fruit 2-2 $\frac{1}{2}$ lines in diameter. Fertile seeds dark brown.

"Loc.—In sandy or rocky soil. Summits of Mounts Behn, Broom, and House; C. 92, near the Symnot Range.

"Affinity.—Distant—*E. rudis* Endl."

I gave a brief note, quoting Mr. Fitzgerald, in *Proc. Roy. Soc., N.S.W.*, LI, 448 (1917).

RANGE.

"Restricted to the sandstone and quartzite ranges, table-lands and sandy foothills. On the shales of Mounts House and Clifton the tree life is largely restricted to *E. confluens* and *Grevillea heliosperma*. Occurs on the conglomerates of Mount Behn." (Fitzgerald in "Kimberley Report.")

Beyond the above, all that has been published by Mr. Fitzgerald is a small-scale photographic illustration with the words "a narrow-leaved tree; of much wider distribution than *E. Mooreana* (W.V.F.) Maiden, see *Journal Roy. Soc., N.S.W.*, XLVII, p. 221, especially north-east of the King Leopold Ranges."*

AFFINITIES.

It is evidently a strong species in the present state of our knowledge, and additional material must become available before one can usefully indicate its relationships.

It will be seen above that Mr. Fitzgerald suggests a distant affinity to *E. rudis* Endl. The material is incomplete, but the drawings on Plate 151 should be compared with those of *E. rudis* in Part XXXIII, Plates 138 and 139. The leaves of *E. confluens* are (on the material available) more uniformly narrow than those of *E. rudis*, nor are the fruits as urceolate as those of *E. rudis*. Their anthers are not very different, while they are similar in bark, and doubtless in general appearance, or Mr. Fitzgerald would not have made the comparison. The timber of *E. confluens* is brownish-red to red, that of *E. rudis* is brown to pale-brown. The evidence is still so imperfect that the question of affinities is still unsolved.

* *Western Mail* (Perth, W.A.), 2nd June, 1906.

Explanation of Plates (148-151).

PLATE 148.

E. occidentalis Endl.

- 1a. Leaf; 1b, buds; 1c, immature fruits; 1d, ripe fruits of Drummond's No. 74.
2. Leaf (note its narrowness), buds and flower of Drummond's No. 152. (See p. 140.)
- 3a. Juvenile leaf; 3b, mature leaf; 3c, anthers, on glandular filaments; 3d, fruits. Kalgan Plains, near Stirling Range, W.A. (J.H.M.)
- 4a. Broad leaf with buds; 4b, broad leaf with immature fruits. Kalgan Plains, north of Kalgan River, W.A. (J.H.M.)
- 5a. Immature fruits; 5b, fruits and small leaves; 5c, fruits, looking from top. Stirling Range, W.A. (E. Pritzel, No. 705), sent out as *E. macrandra*.
- 6a. Swollen buds, on not very broad peduncle; 6b, fruits, with long, curved tips to the valves. Ironstone Hill, near Cut Hill, York, W.A. (O. H. Sargent, No. 302.)
7. Fruits with narrow leaf (compare 2 and 5b). Main road, Growangerup to Broome Hill, W.A. (Dr. F. Stoward, No. 125.)
- 8a. Mature leaf; 8b, bud, distended at summit of operculum as commonly seen in *E. macrandra*, Plate 145, but not uncommon in *E. occidentalis*; 8c, anthers with glandular filaments; 8d, immature fruit. Type of *E. agnata* Domin., from a drawing by Miss M. Smith, of Kew.

PLATE 149.

Mallet Scrub (depauperate form of *E. occidentalis* Endl.)

- 1a. Young leaf, not in the earliest stage; 1b, mature leaf; 1c, buds and flowers; 1d, anthers, with glandular filaments; 1e, 1f, 1g, fruits small in size, and some cylindroid in shape. Mallet Scrub, Kalgan Plains, W.A. (J.H.M.)

E. occidentalis var. *astringens* Maiden.

2. Juvenile leaf, received from a London form from Western Australia (I have a juvenile leaf, nearly as wide, from Broome Hill.)
- 3a. Mature leaf; 3b, buds, showing ridge on calyx-tube; 3c, buds; 3d, anthers; 3e, fruits; 3f, fruits, showing ridge. From trees cut from Mallet bark at Broome Hill, Great Southern Railway, W.A. (J.H.M.)
- 4a. Narrow leaf; 4b, curved buds; 4c, slender fruits. From Salt River, near Meare's Lake, County Peak, Beverley, W.A. (H. St. Barbe More, through O. H. Sargent, No. 707), see p. 146.
5. Fruits more cylindrical than those of the type. Near Kalgan River bridge, Kalgan Plains, W.A. (J.H.M.)

E. occidentalis var. *stenantha* Diels.

- 6a. Leaf and immature fruits; 6b, anthers. Near Coolgardie, W.A. (L. Diels, No. 5245.) (Type of his var. *stenantha*, see p. 147.)

E. occidentalis var. *eremophila* Diels.

- 7a. Mature leaf, texture thick, venation indistinct; 7b, buds; 7c, anthers; 7d, immature fruits; 7e, ripe fruit. Near Coolgardie, W.A. (L. Diels, No. 5237.) Type of his var. *eremophila*.
8. Fruits. Growangerup, 30 miles east of Broome Hill, W.A. (W. Catton Grasby.)
- 9a. Mature leaf; 9b, buds, fruits. Watheroo, Rabbit Fence. (Max Koch, No. 1610.)
10. Spheroid fruits. Kellerberrin, W.A. (F. H. Vachell.)
- 11a. Leaf, broader than the type; 11b, buds with very broad peduncle; 11c, pyriform fruits. 140 miles east of Kalgoorlie, Transcontinental Railway Survey. (Henry Deane, 1909.)

PLATE 150.

E. occidentalis var. *grandiflora* var. nov.

- 1a. Mature leaf; 1b, buds and flowers; 1c, anthers and glandular filaments; 1d, fruits. Note the long peduncle. Kurrawang, W.A. (Dr. J. B. Cleland.) Type of var. *grandiflora*.
 2a. Leaf; 2b, fruits. A few miles south-east of Queen Victoria Spring, W.A., Elder Exploring Expedition, 27th September, 1901. (R. Helms.)

E. macrandra F.v.M.

- 3a. Leaf, not in the earliest stage; 3b, fruits. Valleys south of Stirling Range, W.A. (Maxwell.) The type.
 4a. Fruits. East River, W.A. (Maxwell.)
 5a. Juvenile leaf; 5b, mature leaf and buds; 5c, anthers and glandular filaments; 5d, fruits. Gaalgarup Hill, near Porongorups, Stirling Range district. (J.H.M.)

E. salubris F.v.M.

6. Portion of a trunk, showing the gimlet-like appearance, from which the tree gets its name of Gimlet Gum. Burracoppin, W.A. (Photo, J. B. Cleland.)
 7a. Juvenile leaf; 7b, mature leaf; 7c, buds and flower; 7d, fruits. Goomalling, near Northam, W.A. (Percy Murphy.)
 8a. Juvenile leaf; 8b, 8c, mature leaves of various widths; 8d, buds; 8e, anthers; 8f, fruits. 70 miles north of Kurrawang. (J.H.M.)
 9a. Narrow leaf; 9b, slender fruits. Kellerberrin, W.A. (F. H. Vachell.)

PLATE 151.

E. cladocalyx F.v.M.

- 1a. Mature leaf; 1b, fruits. "Near Spencer's Gulf, S.A." From Melbourne Herbarium. Probably a fragment of the type.
 2a. Juvenile leaf; 2b, mature leaf; 2c, buds (note that the operculum is of greater diameter than the calyx-tube); 2d, anthers; 2e, fruits. Port Lincoln to Coffin's Bay, not far from Lake Wangary, S.A. Probably near the type locality. (J.H.M.)
 3. Buds. Vanilla Forest, Port Lincoln, S.A. (Walter Gill.) In this specimen, the operculum is not wider than the calyx-tube.
 4. Fruits. Kangaroo Island. (J. Staer.) The fruits have a distinct rim, and also a wider orifice.

E. Cooperiana F.v.M.

- 5a. Leaf; 5b, buds; 5c, anther. King George's Sound, W.A. (Maxwell.) The type.

E. intertexta R. T. Baker.

- 6a, 6b, leaves; 6c, twig with buds, traced from the drawing of the type in *Proc. Linn. Soc., N.S.W.* XXV., Plate XVII. (1900.)
 6d. Anther. Drawn from a portion of the type supplied by Mr. Baker.
 7a. Juvenile leaf; 7b, fruits. Mt. Boppy, N.S.W. (J. L. Boorman.)
 8a, 8b, fruits. Coolabah, N.S.W. (R. W. Peacock.)

E. confluens (W. V. Fitzgerald) Maiden.

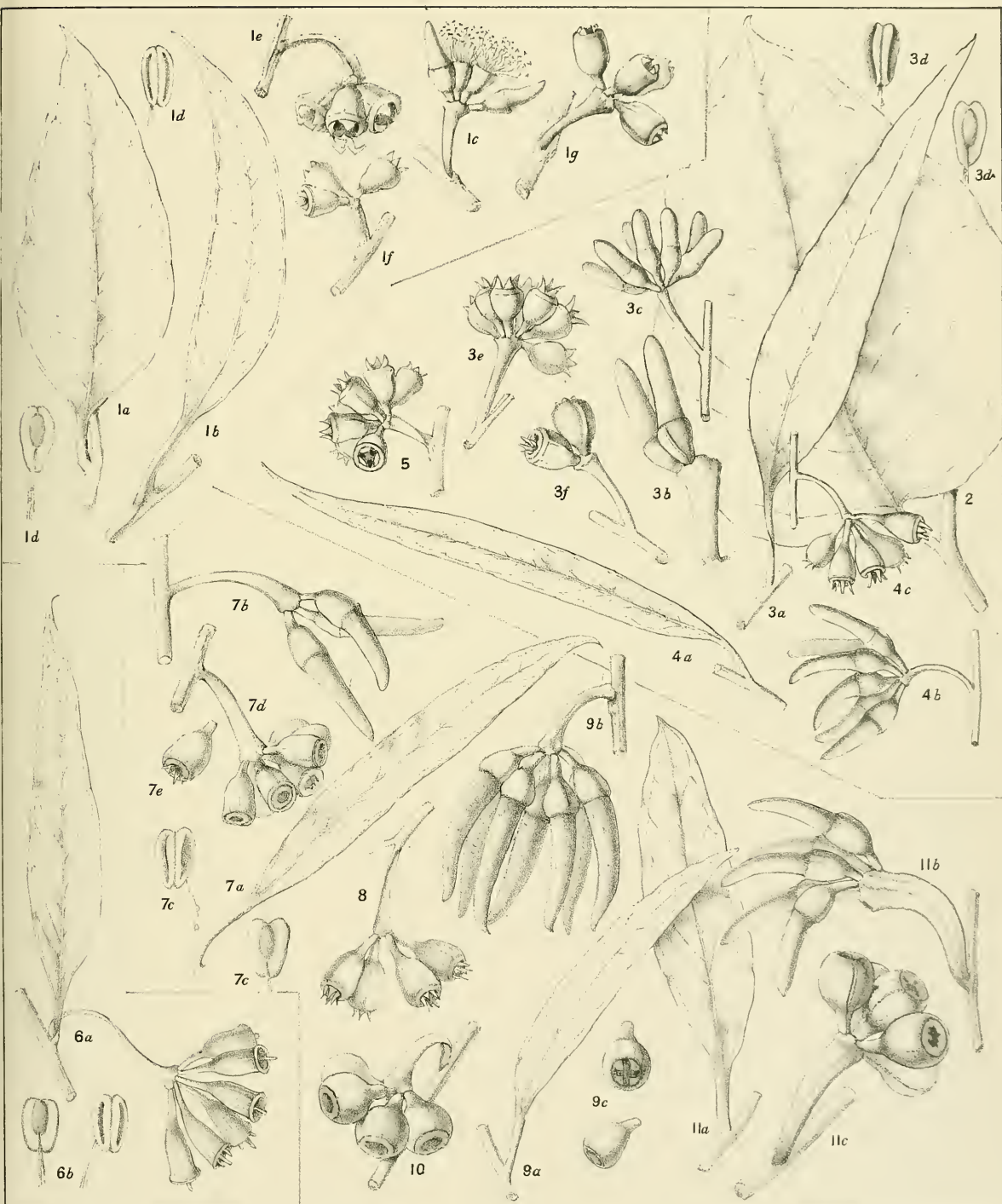
- 9a. Mature leaf; 9b, bud, also section of the same, to show bending of filaments; 9c, anthers; 9d, fruits; 9e, fruit, enlarged to show details of rim and capsular teeth. Summit of Mount Behn, Kimberley district, North-west Australia. (W. V. Fitzgerald, No. 687.) The type.



Floekton, de Leffink

EUCALYPTUS OCCIDENTALIS ENDL. [See also Plates 149 and 150.]

(No. 8 is *E. agnata* DOMIN, included in it.)



M. Flockton del. et lith.

EUCALYPTUS OCCIDENTALIS ENDL. (MALLET SCRUB). (1). [See also Plates 148 and 150.]

EUCALYPTUS OCCIDENTALIS var. ASTRINGENS MAIDEN. (2-5).

EUCALYPTUS OCCIDENTALIS var. STENANTHA DIELS. (6).

EUCALYPTUS OCCIDENTALIS var. EREMOPHILA DIELS. (7-11).

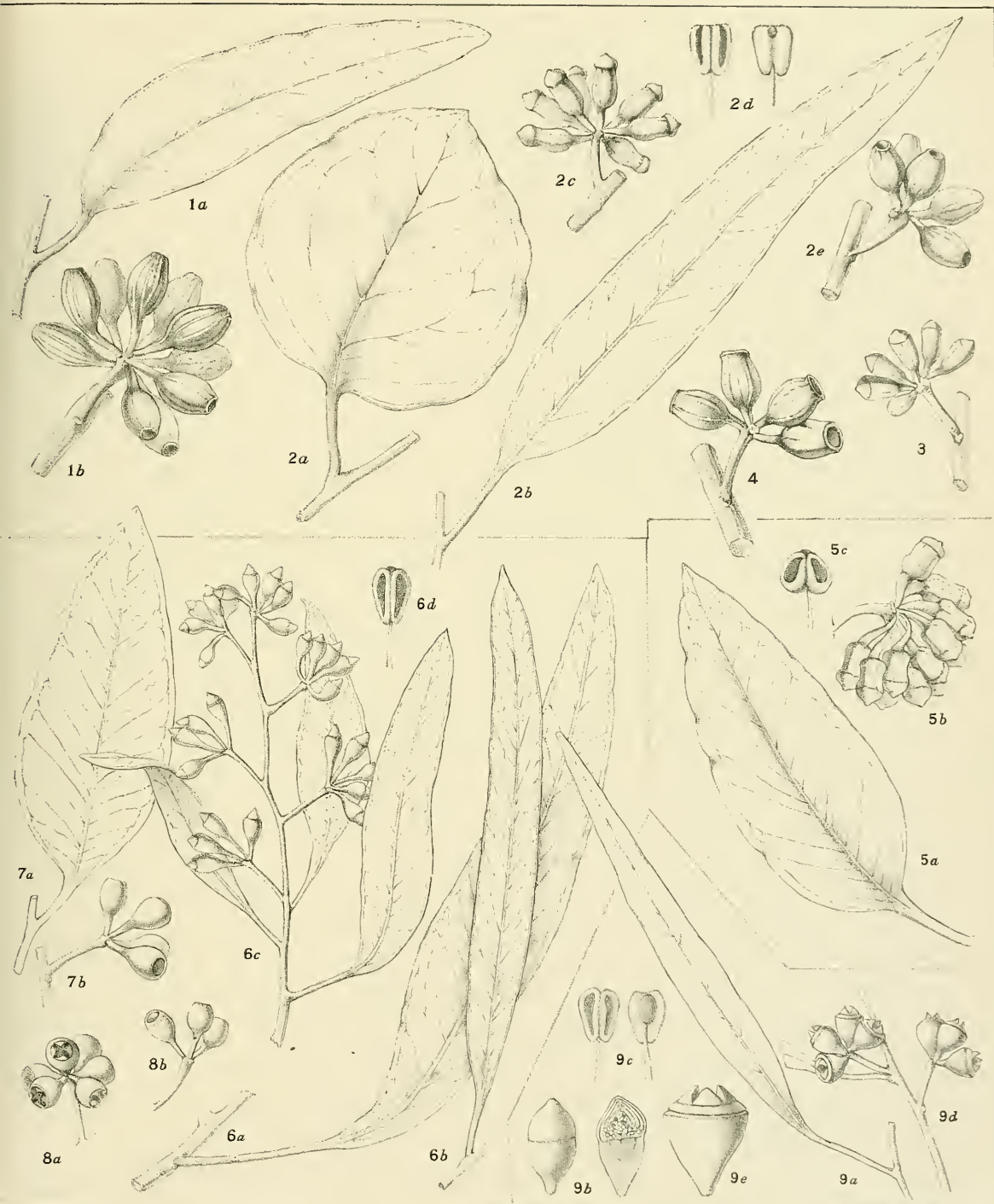


EUCALYPTUS OCCIDENTALIS ENDL., var. *grandiflora*, var. nov. (1-2).

[See Plates 148 and 149.]

E. MACRANDRA F.v.M. (3-5).

E. SALUBRIS F.v.M. (6-9).



M. Flockton, del. et lith.

EUCALYPTUS CLADOCALYX F.v.M. (1-4). E. COOPERIANA F.v.M. (5).

E. INTERTEXTA R. T. BAKER. (6-8). E. CONFLUENS W. V. FITZGERALD. (9).

DESCRIPTION.

CLXXXIX. E. clavigera A. Cunn.

Published by Schauer in Walper's Repertorium ii, 926 (1843).

FOLLOWING is a translation of the original description :—

Branches and branchlets short, rigid, spreading, hispid, terete, glabrous or somewhat hirsute.

Leaves alternate, oblong or ovate, *petiolate* (my italics—J.H.M.), obtuse, penninerved, reticulately veined, glaucescent, imperforate.

Panicles lateral and terminal (the rachis contracted) formed of umbels containing about five flowers; pedicels elongated, striate, on the upper side gradually enlarged into an obconical calyx-tube.

Operculum finely membranous, very little depressed, scarcely umbonate.

In the north-west coast of New Holland, Carcening Bay, Port Nelson. A. Cunn. Herb. No. 242 (1820).

Then Bentham in B. Fl. iii, 250, described it in English, giving *E. polysciadia* F.v.M. as a synonym. In the "Eucalyptographia" Mueller figured it and gave an account of the species, but the form he chose is not quite typical. He says that it flowers while still a shrub.

I have a note on *E. clavigera* in *Proc. Roy. Soc. N.S.W.*, XLVII, p. 77 (1913)—

This angophoroid species was described from Carcening Bay, North-west Australia, just south of York Sound. The original description says the leaves are petiolate, obtuse and glaucescent.

Bentham (B.Fl. iii, 250) says they are sessile or nearly so, while Mueller ("Eucalyptographia") says much the same, but in greater detail.

In its typical form the leaves have a hispid or scabrous surface, but they vary a good deal in length of petiole, width and length of leaf and vestiture.

Mr. W. V. Fitzgerald (MSS) describes it in North-Western Australia as "A tree of 20-40 feet, trunk to 15 feet, diameter 1-1½ feet; bark somewhat rough and greyish on the trunk, soon peeling off in plates, leaving the undersurface white and smooth; timber brownish-red, fairly hard and tough; filaments white to pale-yellow. A "Cabbage Gum."

The juvenile leaves are very large, see figure 5, Plate 152, indeed amongst the largest in the genus, stem-clasping, sessile or nearly so, and more or less clothed with hairs. They may be a foot long and 7 inches wide.

The mature leaves are oblong or ovate and petiolate or sessile. (The original description says petiolate, and Bentham sessile or nearly so.) As development proceeds the leaves become more or less pointed (lanceolate) and it is this form of leaf that Mueller, in the "Eucalyptographia," has wholly depicted.

The species sometimes flowers in the juvenile or opposite leaved stage. The specific name is given because of the club-shaped buds.

It would appear that ripe fruits were not seen by the original describer; Bentham apparently first described them.

The wood is dark-brown, close in the grain and durable. The late Mr. N. Holtze told me that white ants would not touch it in the Northern Territory, where it is common.

SYNONYM.

E. polysciadia F.v.M., in *Journ. Linn. Soc.* iii, 98 (1859).

Mueller, as will be seen, suggested affinity to *E. clavigera*, and Bentham, who edited Mueller's paper, pronounced them to be conspecific. Following is a translation of the original:—

A tree, with strong terete branchlets, the younger ones angular.

Leaves alternate or sub-opposite, somewhat shortly petiolate, ovate or lanceolate, acuminate, thinly coriaceous, imperforate, undulate at the margin, opaque, glaucescent, prominently penniveined and reticulately veined, the peripheral vein unequally distant from the edge, umbels few or more frequently many-flowered, unequally pedunculate, partly divided or composite near the branchlets, forming a leafless, very copious *panicle*, pedicels thin, angular, three or four times longer than the calyx, *buds* pyriform, calyx tube obconical, slightly enlarged at the apex, ecostate, not angled, many times exceeding the patella-like operculum in length, which is not continued into a point, fruits truncate-ovate, somewhat smooth.

Habitat in sunny, stony hills and dry plains near the (Mac)Adam Range (Northern Territory). Flowers in spring.

A small tree, *bark* (if I remember correctly), smooth greyish.

Leaves variable in breadth at the base, often running into the petiole, for the most part 3–4 inches long, $\frac{3}{4}$ –2 inches broad. *Pedicels* $\frac{1}{2}$ –1 inch long. *Calyx*, with the operculum added, $2\frac{1}{2}$ –3 lines long. *Operculum* smooth, sometimes slightly apiculate. *Stamens* whitish, at the most 3 lines long. Anthers ovate-oblong. Fruit 4 lines long. Next to *E. clavigera*.

I have not seen Mueller's type, but, from the description, *E. polysciadia* is probably one of the numerous forms connecting *E. clavigera* and *E. grandifolia*.

RANGE.

Bentham gives Careening Bay, North-west Coast, *A. Cunningham* (the type); Islands of the Gulf of Carpentaria, *R. Brown*; and rocky hills near Macadam Range, *F. Mueller*; Albert River, *Henne*—Macadam Range being in the Northern Territory, while "Islands of the Gulf of Carpentaria," may be either Northern Territory or Northern Queensland, and Albert River is Northern Queensland, near the Gulf.

Mueller in "Eucalyptographia" gives "from the most northern regions of Western Australia along some of the coast tracts of Arnhem's Land to Carpentaria, in sterile country."

Briefly it is found in the northern portion of the continent, from the Indian to the Pacific Ocean, and going south to about lat. 18 deg.

In its typical form it does not occur at any very great distance from the coast.

WESTERN AUSTRALIA.

"Its recorded habitat in this State is from Careening to Roebuck Bays. In no locality is *E. clavigera* far distant from the coast, and always grows in soil of the most barren description" (W. V. Fitzgerald).

The specimens I proceed to note give the range in Western Australia from Roebuck Bay to the Northern Territory. It is not surprising that our knowledge of the tropical Western Australian Eucalypts is so imperfect, for the population is very sparse. Let me say, however, that twigs of the commonest species are desired, in order to settle questions of distribution; the collection of rare species need not worry the passing traveller.

Let us start from near the Northern Territory boundary, and work round the coast generally west and south.

Broad leaves (up to say 6×2 in.), sessile or with petioles up to $\frac{1}{4}$ inch. Scabrous. Ord River, East Kimberley, near Northern Territory border in about 16 deg. S. lat. The Ord River debouches near Wyndham (W. V. Fitzgerald).

Goose Hill. The specimens are the same as Ord River (W. V. Fitzgerald).

Nine Mile Ridge, near Wyndham. From a tree marked by Nyulasy* No. 8 (W. V. Fitzgerald). Precisely similar to Allan Cunningham's specimen. A seedling is well armed with stiff chocolate coloured (when dry) hairs. The leaves are besprinkled with short stiff hairs, which give a scabrous feel. The hairs on the midrib, some of the larger veins, and near the periphery of the leaves, are chocolate coloured, though shorter than the hairs on the rhachis.

The type came from "Careening Bay, Port Nelson," just south of York Sound. It is said never to grow far from the coast. Stem clasping to stalked, rough surface. "Foll. alternis oblongis ovatiuse petiolatis obtusis penninerviis reticulato-venosis glaucescentibus."

North West Coast. Broad, stem-clasping, scabrous leaves (Allan Cunningham). Presented by Kew and probably close to the type.

Broadly lanceolate leaves $5 \times 2\frac{1}{4}$ in., petioles of $\frac{1}{2}$ inch long, panicles glabrous. Meda (W. V. Fitzgerald).

May River. Same as Meda (W. V. Fitzgerald, No. 382). These two localities are in West Kimberley, and a little north-east of Derby.

These two specimens differ from typical *E. clavigera* in absence of hairs and in the presence of longish petioles. They are, however, roughish to the touch, but this is owing to the raised reticulation of the smaller veins. These specimens undoubtedly show transit to *E. grandifolia*.

* Mr. C. Y. Nyulasy was second in command to Mr. H. F. Johnston in a survey near Cambridge Gulf in 1885. See *W.A. Year Book* for 1900-1, p. 65.

Broome (W. V. Fitzgerald, No. 153). Very like the type, except that it has very short petioles and there are brown hairs on the rhachis and very few of any kind on the leaves. Broome is in Roebuck Bay, in 18 deg. S., and is the most southern Western Australian locality known to me for this species.

NORTHERN TERRITORY.

It was collected nearly 115 years ago in the territory, and it has been obtained there but infrequently since.

"North Coast." Probably "Islands of the Gulf of Carpentaria," as in B. Fl. iii, 250 (Robert Brown, 1802-5). Almost glabrous, a few hairs on the rhachis and larger veins. Some of the leaves almost a perfect oval. Note the axillary inflorescence. It is usually large and terminal in *E. clavigera*.

"Cabbage-leaf Gum," Cullen Creek, on Overland Telegraph Line. (Prof. Baldwin Spencer.) This is one of the species with very large juvenile leaves. Some of them are a foot long and 7 inches wide. Slightly scabrous. Smooth white bark. Bears a remarkable profusion of inflorescence.

QUEENSLAND.

Perhaps the following references by Leichhardt to "Apple Gum" in his "Overland Expedition from Moreton Bay to Port Essington," refer to *E. clavigera*; in cases where they do not, they certainly refer to its allies. Unfortunately many specimens of this expedition were abandoned owing to the hardships encountered, and this applies to the timbers and to some of the herbarium specimens, some of the latter being destroyed in crossing creeks.

" Another Eucalyptus with a scaly butt like the Moreton Bay Ash, but with smooth upper trunk and cordate ovate leaves, which was new to me; we called it the Apple Gum " (p. 264).

" On the small flats, the Apple-gum grew with a few scattered Moreton Bay Ash trees." (p. 283).

" The Apple-gum, which we had missed for some time, again made its appearance, accompanied by another White Gum, with long narrow leaves." (p. 325).

" The hills were composed of iron-sandstone; their summits were generally very openly timbered with Apple Gum and a new white-barked tree." (p. 337).

" and the Bloodwood, the Leguminous Ironbark, the Box, the Apple-gum, formed patches of open forest." (pp. 374, 388).

" The Apple-gum, a Bloodwood, and the Poplar-gum (?) grew round our camp; the grasses were tender, but formed distinct tufts; Crinum was plentiful." (p. 473).

" *E. clavigera* has recently been brought from the Mitchell and Gilbert Rivers by Mr. Edward Palmer, who observed that also on old trees of 40 feet height the leaves were mostly opposite, that the bark is rough and light brown towards the base of the stem, but otherwise smooth and whitish." (*"Eucalyptographia"* under *E. tessellaris*.)

Following is an excellent account of the tree as it occurs in Queensland :—

" *Eucalyptus clavigera* (No. 4,159) is what eastern New South Wales bushmen would be likely to call Apple-gum. Its leaves as seen around Alma-den are sessile, often cordate and opposite, both in the primary and adult forms, and ovate, the hispid midrib and lateral veins standing out in relief on both sides of the

leaf, which is excessively scabrous or harsh to the touch. In general appearance the leaves closely resemble those of *Angophora subclutina* F.v.M. (Apple Tree) and some of the juvenile forms measured 8 by 5 inches, and it is known that these dimensions are exceeded in other localities. The bark on the main portion of the trunk and branches is white and smooth, while that at the base and for a height of 8 or 10 feet is tessellated in a manner very similar to that of *Eucalyptus tessellaris* F.v.M. The trees reach a height of 50 feet, with a diameter of 2 to 3 feet, and if dead, will burn right away after being lighted, a character common also to the Angophoras. Neither buds nor flowers were seen, but some empty seed vessels, 1.2 cm. long and 9 mm. in diameter were procured, having pedicels up to 2.2 cm. long.

There seems no doubt that these trees belong to the same species as those referred to by Leichhardt as Apple-gum, and which were first seen by him near the head of the Lynd River, and afterwards until after he had crossed the Roper River in the Northern Territory. His first entry reads :—" Another Eucalyptus with a scaly butt like the Moreton Bay Ash, but with a smooth upper trunk and cordate ovate leaves, which was also new to me; we called it Apple-gum." (Op. cit. p. 264, 304, 325, 353, 394, 464, 473).

This Apple-gum was seen by me at various points between Alma-den and Normanton, and again in the Cloncurry River District." (R. H. Cambage, *Proc. Roy. Soc., N.S.W.*, XLIX, 405, 1915).

Following are records of individual specimens :—

"Cabbage Gum." Almost all the leaves on the small side, and generally resembling those from Stannary Hills and Alma-den. The sender notes the variation and observes that they are all from the same three or four trees. Chillagoe, 139 miles west of Cairns (E. Doran).

Tree of 50 feet. Tessellated bark for about 10 feet, then white and smooth. On granite at 1,600 feet. Alma-den, Cairns Railway, 17 miles from Chillagoe (R. H. Cambage, No. 4,159). Leaves all sessile and slightly scabrous, varying, as usual, from broadly ovate to lanceolate.

A scaly barked, straggly small tree, the young leaves broadly lanceolate, sometimes acuminate, and stem-clasping, and densely clothed (on the rachis, veins and young shoots, as is usually the case) with soft shortish brown hairs. The young leaves at least 8 x 5½ inches. The adult leaves stem-clasping or with the shortest petiole and with very few hairs as maturity arrives, becoming eventually only a little scabrous.

Colour of timber rich deep brown. Ten Mile, Stannary Hills (Dr. T. L. Bancroft and R. G. Shearer).

Normanton, south-east angle of Gulf of Carpentaria (Ivie Murchie).

Gulf Country, F. Hann, No. 3. Also Lake Dunn; both from Queensland Herbarium (labelled *E. setosa* Schau.). As regards Hann's Expedition (I do not know of a F. Hann), see Queensland Parliamentary Paper, 1873, fcp. pp. 26 and 2 litho. maps. It contains "Copy of the diary of the Northern Expedition under the leadership of Mr. William Hann." The diary begins 26th June, and ends 12th November, 1872. In *Proc. Aust. Hist. Soc.* (Sydney) iii, 194, Dr. R. L. Jack gives an excellent abridged account of this Expedition.

AFFINITIES.

E. clavigera A. Cunn. is perhaps the most typical member of a group which in its fruits of papery-like thinness has affinity to *Angophora*, and may perhaps be termed Angophoroideæ. Besides the species in the present part, they include *E. brachyandra* F.v.M. in Part XXX, and *E. tessellaris* F.v.M. and *E. Spenceriana* Maiden in Part XXXVIII. I have to be content with this reference at this place, since the plan of this work does not permit discussions or group-affinities, which is reserved until the taxonomic portion is farther advanced.

1. With *E. grandifolia* R. Br.

"In the botanic collections formed by Mr. Schultz at Port Darwin, specimens of *E. grandifolia* occur, which show the leaves more generally opposite, all conspicuously stalked and all broad, the flowers larger on still longer and also stronger stalklets, the lid broader, not shining, somewhat wrinkled, more convex and prominently pointed; fruit is not available for comparison." ("Eucalyptographia," under *E. clavigera*).

Let us compare Plates 152 with Plates 153 and 154 (*E. grandifolia*). The two species seem to be sufficiently separated by the hairy, sessile juvenile leaves of *E. clavigera*, contrasted with the glabrous, petiolate leaves of *E. grandifolia*. In *E. grandifolia* the mature leaves are more variable, and the fruits larger.

2. With *E. tessellaris* F.v.M.

"*E. tessellaris* differs in all the branches being smooth, the leaves all scattered and narrow with closer veins, the flowers smaller on short stalklets, and also generally fewer in each individual umbel, and perhaps in its tessellar semipersistent bark." ("Eucalyptographia" under *E. clavigera*).

"In reality our present plant (*E. tessellaris*) is more nearly akin to *E. clavigera*, differing principally in the smoothness of the branchlets and young foliage, in the narrowness and always scattered position of the leaves, and in the lesser number and shortness of its flower-stalklets." ("Eucalyptographia" under *E. tessellaris*.)

The affinities of these two species will be again referred to when *E. tessellaris* is reached in Part XXXVIII.

3. With *E. alba* Reinw.

Bears close affinity to *E. clavigera*. (F.v.M. in "Eucalyptographia" under *E. alba*).

Compare Plates 105 to 107, and especially 106, with the juvenile leaf, Part XXV. There is some superficial resemblance, particularly in regard to the large juvenile leaves, but this resemblance is rather with *E. grandifolia*, which Mueller might not have recognised, as distinct from *E. clavigera*. The buds of *E. alba* are not clavate, and the fruits of that species do not belong to the Angophoroideæ.

DESCRIPTION.

CXC. *E. aspera* F.v.M.

In *Journ. Linn. Soc.* iii, 95 (1859).

FOLLOWING is a translation of the original :—

A tree, branchlets somewhat terete, hispid, leaves small, opposite, papery, oblong-ovate, obtuse, cordate at the base, sessile, glaucous, opaque, scabrous, penniveined, on the under side reticulately veined, covered more or less with oil-dots, rough along the midrib, the longitudinal vein distant from the edge, umbels axillary, sessile (shortly pedunculate with hispid peduncles—R. Kippist), two or few-flowered, pedicels (very glabrous,—R.K.) a little longer than the somewhat campanulate ecostate fruit, valves included.

Habitat in sandy, hilly plains (sandstone tableland), more or less elevated up to the Victoria River and Sturt's Creek, in Arnhem's Land, and not very common near the Gulf of Carpentaria. Flowers in spring.

A small tree with smooth greyish-white (ashy-white) bark. Leaves for the most part 1–2 inches long, 8–12 inches broad. Fruit almost 3 lines long. Its affinity is *E. setosa* Schauer.

Bentham (B. Fl. iii, 254) describes it in the following words :—

106. *E. aspera*, F. Muell. in *Journ. Linn. Soc.* iii, 95. A small tree, with a smooth ashy-white bark (*F. Mueller*), the branchlets and often the leaf-veins scabrous or hispid, the foliage often glaucous. Leaves sessile, opposite, cordate, ovate or oblong, obtuse, mostly under 2 inches long. Peduncles axillary or lateral, very short, each bearing two to six flowers, on pedicels either very short or longer than the calyx. Calyx-tube short and broad, 2 to nearly 3 lines diameter. Operculum hemispherical, obtuse, shorter than the calyx-tube. Stamens 2 to 3 lines long, inflected in the bud; anthers oval-oblong, with parallel distinct cells. Fruit ovoid-truncate, slightly contracted or straight at the orifice, 3 to 4 lines long, the rim thin, the capsule deeply sunk.

It is not described in the “*Eucalyptographia*.”

Note that the flowers are two or few flowered as described; they are described as 2–6 by Bentham, and so figured in fig. 7a, Plate 152.

RANGE.

The type came from the sandstone table-land of the Upper Victoria River and Sturt's Creek, but it is added that it is not very common near the Gulf of Carpentaria. This statement could only be proved in regard to the track pursued by Mueller in the Gregory Expedition of 1856. We know but little of the range of the species, even yet; it has probably been passed over for *E. clavigera*. It has not yet been found with

certainty out of the Northern Territory. It will probably be found in Queensland (round the Gulf), but the Queensland specimens hitherto referred to this species are not satisfactory.

211.—Tanami Tin Field (Dr. H. I. Jensen, 1914). 10–15 feet high. A dwarf gum with white, smooth bark. Spreading foliage, good shade. Sessile leaves.

480.—South Newcastle waters, 27th September, 1911. “Snapping Gum,” up to 2 ft. 6 in. in diameter. Leaves and fruits (G. F. Hill).

AFFINITIES.

1. With *E. setosa* Schauer.

In the original description, Mueller stated that the affinity of *E. aspera* is with *E. setosa*.

The position of *E. setosa* is rather with the Corymbosæ, at least so far as the fruit is concerned. Mueller's original description of the fruit of *E. aspera* as “somewhat campanulate and ecostate, valves included,” does not help us much without other data.

Bentham's specimens “are not in good state,” but he describes the fruit as “ovoid-truncate, slightly contracted or straight at the orifice, 3 to 4 lines long, the rim thin, the capsule deeply sunk.” The fruits are the thin papery ones of the *clavigera* group, and not the thick woody, coarse ones of the *setosa* group.

2. With *E. clavigera* A. Cunn.

In B. Fl. iii, 250, Bentham places *E. aspera* near *E. grandifolia*, *clavigera*, and *tesselaris*, though in the Key (p. 198) he places it nearer to *E. doratoxylon*.

E. aspera, from the testimony of the thin papery fruit alone, comes closest to the *E. clavigera* group, as already indicated.

DESCRIPTION.

CXCI. *E. grandifolia* R. Br.

In *B. Fl.* iii, 250 (1866).

FOLLOWING is the original :—

R. Br., Herb. A small tree, with the outer *bark* brown and deciduous, the inner whitish and very smooth (R. Brown).

Leaves opposite or nearly so, petiolate, from ovate to ovate-lanceolate, 4 to 6 inches long in the specimens, but probably often larger, rigid, with rather fine diverging veins, the intramarginal one remote from the edge.

Flowers rather large, on pedicels of $\frac{1}{2}$ to $\frac{3}{4}$ inches, three to ten together, rather clustered than umbellate, on a very short lateral peduncle, reduced sometimes to a tubercle (probably the inflorescence consists of several umbels reduced to one or two flowers each).

Calyx-tube very short, broad, and open, 4 to nearly 5 lines diameter.

Operculum convex or almost hemispherical, obtuse or umbonate, much shorter than the calyx-tube.

Stamens 4 to 5 lines long or rather more, inflected in the bud, anthers oblong, with parallel distinct cells.

Ovary flat-topped.

Fruit—Unknown.

Juvenile leaves very large, petiolate, glabrous. Dr. Jensen sent from Darwin a juvenile leaf which, in its dried state, is 16 inches long and $7\frac{1}{4}$ inches broad. A large one is figured at fig. 1, p. 153.

Mature leaves often puckered (more than undulate), smooth and leathery. They may be quite narrow, and may be still opposite. The extraordinary variation in the leaves of this species is only partly brought out in Plates 153 and 154. These large leaves differ from those of *E. clavigera* in being petiolate and glabrous.

The buds have very long pedicels. The fruits are cylindroid to hemispherical, often urceolate and sometimes very large.

The late Mr. J. G. Luehmann (*Proc. Aust. Assoc. Adv. Science* VII, 525) looked upon *E. grandifolia* R. Br. as a variety of *E. clavigera* A. Cunn.

RANGE.

Bentham gives "Islands of the Gulf of Carpentaria," *R. Brown* (perhaps Northern Territory), as the only locality.

It is found also in the tropical portions of Queensland and Western Australia, with abundant connecting localities to the Northern Territory ones.

WESTERN AUSTRALIA.

Found at Mount Harris, West Kimberley, among quartzite rocks (W.V.F.'s, No. 1,115). A shrubby form, 4-8 feet high, with a smoothish white stem; pedicels clustered on old wood, very slender, about 1 inch long. Fruit ovoid-oblong, about $\frac{1}{2}$ inch long, rim thin; valves sunk, included (W. V. Fitzgerald, MSS).

Near Camp 92, Synnott Range, West Kimberley, west of the preceding locality. Both about 16 deg. 30 minutes. (W. V. Fitzgerald No. 1,272, received as *E. clavigera*).

May River (W. V. Fitzgerald No. 506 as *E. clavigera*). An entirely glabrous, lanceolate leaved form allied to *E. papuana*, but the fruits are those of *E. grandifolia*. An intermediate form.

NORTHERN TERRITORY.

The type was distributed by the British Museum (J. J. Bennett), in 1876 under the number 4,788, with the locality "Gulf of Carpentaria" or "Islands A. and C, Carpentaria" (Robert Brown, 1802-5). I do not know what these islands are; no doubt a clue will be given from some letter or diary of Robert Brown later on. At pp. 106 to 109 it will be seen that I have given notes* on a number of Brown's collecting places on the South Coast and Northern Queensland, which will help botanists who have Brown's original herbarium labels.

I have for many years given special attention to the routes and labels of the old collectors. In modern days we are (or should be) most careful in regard to the particulars on the label of a herbarium specimen, but the old collectors frequently obtained their specimens in unnamed localities, and often collected under difficult circumstances. We want precise localities in order that we may obtain additional material for further study and also to distribute to others specimens as close to the type as possible.

Examination of the notes on this species shows how much I am indebted to Dr. H. I. Jensen and Mr. G. F. Hill, at the time both scientific officers of the Commonwealth Government at Port Darwin. These notes were backed by the best specimens I have ever seen, collected by anybody in the Northern Territory. Botanically, their departure from the Territory is a great loss, and I trust that they will be succeeded by others who will take naturally to this kind of work, for it cannot be done properly unless personal predilection exists in this direction. These gentlemen sent fine suites of specimens of the *Corymbosæ* also, and Mr. Hill a number of excellent photographs.

The last word has not been said about *E. grandifolia*. It is variable in itself, and touches other species, being, in my view, part of a large series. Dr. Jensen thinks he can divide the specimens I have grouped under *E. grandifolia* under two series, which I call (*a*) and (*b*).

In the following enumeration Dr. Jensen looks upon Nos. 352 and 353 as typical of group (*a*). This usually goes under the name "Moreton Bay Ash,"—bark slightly rough, marked into squares at base of trunk (see *E. tessellaris* in Part XXXVIII), white

* See my "Sir Joseph Banks; the Father of Australia."

higher up, or entirely white bark, leaves narrowish and long, generally curled or twisted; branches crooked and ungraceful. Leaves stalked. Timber very inferior, except for burning purposes; badly attacked by white ants and borers.

"Moreton Bay Ash." Melville Island. Leaves a little narrower than the type, and some as narrow as those of *E. papuana* (Prof. Baldwin Spencer).

"White River Gum (so called locally). Large tree growing on flats near creeks and river. Stem covered with scaly flakes near ground, say up to 2 feet, above that smooth, greyish or whitish bark." Howard Creek near Darwin (G. F. Hill No. 363).

"Smallish tree. Rough bark on trunk and lower branches. Branches smooth, white." Leaves lanceolate, very like fig. 1b, Plate 154. Darwin (G. F. Hill No. 342).

"Moreton Bay Ash." Lanceolate leaves (a good deal resembling those of *E. papuana*), buds large, almost typical. Rapid Creek near Darwin (Dr. H. I. Jensen No. 354). A form connecting *E. papuana* and *E. grandifolia*.

A form with very long lanceolate leaves. See fig. 2a, Plate 154. Darwin (G. F. Hill).

Huge lanceolate juvenile leaf $16 \times 7\frac{1}{4}$ inches. Darwin (Dr. H. I. Jensen).

Typical of the tree about Stapleton-Darwin. Stapleton is on the railway, 60 miles south of Darwin (G. F. Hill No. 447).

"Trees sometimes fairly spreading, sometimes tall and erect. Creamy or whitish bark, except near ground, where it is flaky, flecked with greyish or rusty red for a height of 1-4 feet from ground. Grows on flats at foot of hills in grey soil gullies amongst low ranges or on open grey soil flats away from hills, usually on poor sour soil." Stapleton (G. F. Hill No. 449). With very large and *corymbosa* like fruit, though with longitudinal veins. See figs. 3 and 4, Plate 153.

"Moreton Bay Ash." McKinlay River flats, Burrundie (Dr. H. I. Jensen No. 389).

"Cabbage Gum. Rough bark like Bloodwood bark to top. Associated with Moreton Bay Ash. Medium sized tree, smooth barked specimens with similar leaves and fruits grow to a large size." McKinlay Flats, Burrundie (Dr. H. I. Jensen No. 349).

Leaves up to 11 inches long and $8\frac{1}{2}$ inches wide, with a petiole of $1\frac{1}{2}$ inch. See fig. 1, Plate 153. These leaves can readily be confused with those of *E. clavigera*, but the latter are usually more sessile, thicker and scabrous. Pine Creek Railway (E. J. Dunn).

"Broad-leaved variety." Woolngi (Dr. H. I. Jensen No. 407).

"Moreton Bay Ash type of stem. Associated with *E. alba*. Leaves small. On the slate country in parts, the Moreton Bay Ash type of this species is abundant." Umbrawarra (Dr. H. I. Jensen No. 405).

"A very fine sight in flower, perfectly white." North of latitude 15 deg. (W. S. Campbell).

"Moreton Bay Ash (Cabbage Gum with tessellated bark at base of trunk)." Burrundie (an inland district) north of Pine Creek (Dr. H. I. Jensen No. 352). With large *corymbosa*-like fruits, nearly as large as those of No. 449, but with longer pedicels. Leaves of medium size, sharply tapering to both ends, and with long pedicels. They are strongly reminiscent of Kurrajong leaves.

"Moreton Bay Ash." Rapid Creek near Darwin (near coast) (Dr. H. I. Jensen No. 353). Leaves similar to No. 352 or narrower and more lanceolate. Fruits of the ordinary *grandifolia* type. See figure No. 3, Plate 154, representing Stapleton No. 447.

Following is Dr. Jensen's group (*b*), and he says Nos. 350, 351, 355 and 356 are typical of that group. (*b*), he says, is locally known as "Bastard Bloodwood or Cabbage Gum," rough bark all or most of the way up, irregularly furrowed and not sensibly marked into squares or even-sized scales. Leaves stalked, broad, generally somewhat twisted. Timber inferior."

We want further evidence to see if (*a*) and (*b*) are conspecific.

"Medium sized to large trees on flats; smallish on hills. Bark ranges from the Moreton Bay Ash type to entirely rough like Bloodwood, or again quite smooth, white over entire stem on flats. Without curly character of leaf or shape and characteristics of seed capsules changing. The tree when it has rough bark half way up stem is known as Moreton Bay Ash. The other forms are known as Cabbage Gum. Large tree, dense foliage." Near type, Burrundie (Dr. Jensen No. 350).

"Cabbage Gum. Rough bark three parts up stem." Leaves near type, but one leaf as narrow as those of *E. papuana*. Pine Creek, terminus of the railway, an inland district (Dr. H. I. Jensen No. 351).

"Cabbage Gum." Somewhat crooked-limbed, scraggy trees, height 30 feet, up to 12 inches in diameter, with rough bark, like that of Bastard Bloodwood (*E. Foelschiana*) half-way up stem, white smooth bark on branches. Leaves twisted and elongate." Not very far from type. Pine Creek (Dr. Jensen No. 355).

"Cabbage Gum." "Rough bark three-quarters of way up stem and in some trees up to branches, not distinctly marked into squares; more like Bloodwood" [*E. Foelschiana* (?)] Pine Creek (Dr. Jensen No. 356). Very similar to No. 355.

Powell's Creek, Telegraph Station in 18 deg. S. lat., Newcastle (Prof. Baldwin Spencer).

"Small tree. Trunk rough up to first branches; upper branches smooth, whitish with few greyish blotches." Growing in front of Mines Office, Darwin (Dr. Jensen No. 364). Narrow lanceolate leaves, not very dissimilar to those of *E. papuana*, but the profuse compound umbelliferous inflorescence (of which the specimen mainly consists) is very different. There is some variation in the leaves of this tree.

Dr. Jensen (a few months after he had left the Territory), wrote that "We have *E. grandifolia* in its two forms in the Territory, but no *E. tessellaris* or its variety." By the variety *E. papuana* is meant (J.H.M.). I have already referred to his forms (*a*) and (*b*).

QUEENSLAND.

"Broad-leaved Gum." Very large lanceolate leaves. Chillagoe (E. Doran). Very large lanceolate leaves; Pandanus Creek (E. B. Yearwood).

The specimens of Dr. T. L. Bancroft (July 1909) referred to in *Proc. Roy Soc.* XLVIII, 79 (1913) are not complete. They are without buds or flowers or fruits *in situ*, although some fruits were sent "from an old tree." These have short pedicels, longer than typical *E. papuana* and very much shorter than those of *E. grandifolia*. On the material available, we have a transit form between the two species, and when a complete set or sets of specimens of the Stannary Hills trees are available, the matter can be reconsidered. Meantime the facies of Dr. Bancroft's material is such that it is placed provisionally with *E. grandifolia*.

"Cabbage Gum." Juvenile leaves, which are thinner and more acuminate than the mature ones. The branchlets are quite angular. Croydon, near Gulf (James Gill). "White Wood" or "White Gum." Normanton (Ivie Murchie).

AFFINITIES.

1. With *E. clavigera* A. Cunn. Already dealt with at p. 184.
2. With *E. papuana* F.v.M. Dealt with at p. 198. *E. grandifolia* may be looked upon as having certain characters intermediate between *E. clavigera* and *E. papuana*.
3. With *E. alba* Reinw.

Under *E. clavigera*, at p. 184 it is stated by Mueller that *E. alba* bears close affinity to *E. clavigera*. This is not true as regards any of the Angophoroideæ, with their characteristic fruits, but Mueller is probably referring to the large juvenile leaf of *E. alba* (see fig. 6, Plate 106), as compared with that of *E. grandifolia* (fig. 1, Plate 153). They are both very large, petiolate, and glabrous (different, except in size, from *E. clavigera*), and although the leaf of *E. alba* is larger, I have seen a leaf of *E. grandifolia* quite as large. The fruits of the two species are very different.

4. With *E. Foelschiana* F.v.M.

One must be on one's guard, when only specimens in bud or flower are available, concerning the coarse-leaved Corymbosæ and particularly *E. Foelschiana*, foliage specimens of the two species being sufficiently similar to necessitate caution.

DESCRIPTION.

CXCVII. *E. papuana* F.v.M.

In *Papuan Plants* 8 (1875).

FOLLOWING is the original description, which is now difficult to obtain :—

(Sect. *Leioploia*). Branchlets towards the summit slightly angular; *leaves* scattered, short-petioled, chartaceous, oblong-lanceolar, dull green, hardly oblique; their lateral veins fine, numerous, very patent; their longitudinal vein close to the margin; the oil-dots exceedingly minute, almost obliterated; *peduncles* axillary, short, slender, bearing an umbel or a cymous corymb of but few flowers; *calyx* rather small, pear-shaped, without angles, borne on a slender pedicel of nearly the same length; the *lid* patellar, several times shorter than the tube, almost membranous, not pointed; *anthers* narrow-oblong, their parallel cells opening longitudinally throughout; *fruit* hemiellipsoid, its margin thin, long surpassing the valves; *style* only by its summit exerted; *stigma* not dilated, *vertex of the capsule* flat; *seeds* wingless.

On the mainland of New Guinea opposite to Yule Island, about 12 miles distant from the shores.

Branchlets thin. *Petioles* $\frac{1}{2}$ – $\frac{2}{3}$ inch long. *Leaves*, 3–5 inches long, not shining. *Umbels* deflexed. Whole *calyx* 3–4 lines long. *Fruit* nearly $\frac{1}{2}$ -inch long, about $\frac{1}{3}$ inch wide.

Then follow some notes in regard to the relations of this species and *E. clavigera* A. Cunn. and *E. tessellaris* F.v.M. See p. 198.

For an admirable account of this tree as it occurs in Queensland, see Mr. Cambage's note published under "Range" at p. 196. He describes the bark, timber, leaves and fruit.

See a note by myself as to recognition of *E. papuana* see *Proc. Roy. Soc. N.S.W.* XLIX, 330 (1915).

It will be observed that the leaves are short petioled ($\frac{1}{2}$ – $\frac{2}{3}$ inch) and oblong lanceolar (in the type), that the peduncles are axillary, short, and bear few to many flowers, which are disposed in an umbel or a "cymous corymb." The characters may be observed from consideration of Plate 155. The leaves are variable in shape and size. The juvenile leaves are broad, and approach those of *E. grandifolia* (see also under No. 446, p. 195); the fruits are closely related to those of other members of the series.

The leaves of the type, of coastal origin, are thin and dull; those from far inland localities on the mainland are thickish and very often yellowish.

The buds are clavate and pedicellate to spheroid and nearly sessile, or with pointed opercula and pedicellate.

The fruits, while usually cylindroid, are often more or less campanulate.

SYNONYMS.

1. *E. tessellaris* F. Muell., var. *Dallachiana* Benth.

Veins of the leaves more oblique, the intramarginal one not so close to the edge, the cluster of umbels so dense as to be reduced almost to a sessile head. Queensland, *Bowman*; Rockhampton, *Dallachy* (B. Fl. iii, 251).

2. *E. clavigera* A. Cunn. var. *Dallachiana* Maiden. (*Proc. Roy. Soc. N.S.W.* XLVII, 77, 1913).

The placing of the tree called by Bentham *E. tessellaris* F.v.M. var. *Dallachiana* under *E. tessellaris* was acquiesced in by Mueller and Bailey, but it has from time to time raised protests. For example—

“The variety *Dallachiana*, although described only as such, has certainly all the claims to a separate species, inasmuch as that it totally differs from *E. tessellaris*, at least in bark, leaves, and wood. It is the “White Gum” of the settlers, and the “Dangalboora” of the aborigines, and is a middle-sized spreading tree, with a white smooth bark which is entirely deciduous. The adult foliage is much larger and of a paler hue than that of *E. tessellaris*, and the leaves from adventitious shoots are generally 6 to 13 inches long and 3 to 4 inches wide. The seedling plants are hispid, with the leaves opposite, broadly ovate and shortly petiolate, but not peltately attached; the seedlings of *E. tessellaris* are also hispid, but the leaves are much smaller and nearly sessile*.”

In the following passage *E. tessellaris* is the inferior timber, while the durable timber refers to the so-called variety *Dallachiana* :—

“Accounts of this timber are conflicting. The Rev. J. E. Tenison-Woods states that about Moreton Bay, Gympie, &c., the wood is not valued for any purpose whatever; about Rockhampton, Mr. O’Shanesy says that the heart-wood is good enough but the sap-wood soon decays; about Townsville and Charters Towers the wood is highly esteemed, and employed for all useful purposes. Mr. Woods says the only way to account for these various statements is by supposing the warmer climate is its proper habitat. This is by no means the only Eucalyptus timber in regard to which statements from different localities are conflicting.”†

The late Dr. Joseph Bancroft, a keen observer of our flora, wrote as follows, whether in print or in a letter to me, I cannot at this moment say :—

“The wood is heavy and not much used in Brisbane (Moreton Bay Ash, *E. tessellaris*—J.H.M.) for economic purposes, but in the northern part of the colony (the tree under discussion—J.H.M.) it is found valuable, leading to the supposition of the northern tree being of another species. It is very combustible, and dead trees will burn away entirely, root and branch, often without assistance.”

The same discordant remarks on the wood are seen in the catalogue of the Queensland Forestry Museum, 1904, under *E. tessellaris*, where we have

“Not often used in southern Queensland, but extensively for buildings, fences, &c., in the north, where this kind of timber is better, being very tough and durable.”

* O’Shanesy, *Contrib. to Fl. Q’land*, p. 40, 1880.

† *Proc. Linn. Soc., N.S.W.*, vii, 334, 1883, quoted in my “Useful Native Plants of Australia.”

Dr. Joseph's son, Dr. T. L. Bancroft, wrote me as follows in July, 1909, from Stannary Hills, North Queensland :—

"Bentham's *E. tessellaris* var. *Dallachiana* is not at present in flower; I found it hard to preserve the flowers; they shake to pieces so readily.

"*E. tessellaris* I know well; it occurs here also, but the species under consideration is a totally different species. The leaves are very large and twisted, in the saplings more especially; some few leaves are enormous. The largest trees are about 50 feet high and 1 foot in diameter. The bark is white or greyish, very like *E. tereticornis*, our Blue Gum. There is no rough bark as in *E. tessellaris*."

The tree is common in northern Queensland, where it is called "Desert Gum," "Cabbage Gum," or "Pudding wood."

There is no doubt that it is an error to keep it under *E. tessellaris*, but I am not satisfied that it is a distinct species. It is, in my opinion, an extreme form or variety of *E. clavigera*, A. Cunn., with narrow lanceolate leaves. I take Bentham's description of *E. tessellaris* var. *Dallachiana* as typical for my *E. clavigera* var. *Dallachiana* :—

"Veins of the leaves more oblique, the intramarginal one not so close to the edge, the cluster of umbels so dense as to be reduced almost to a sessile head." (B. Fl. iii, 251).

It seems very different at first sight to *E. clavigera* A. Cunn., of north-western Australia, but I have specimens which seem to absolutely connect the two forms. The timber of *E. clavigera* is deep brown and abhorrent to white ants at Darwin; the timber of our "Cabbage Gum" or "Pudding-wood" is similarly durable, much more so than that of the Moreton Bay Ash (*E. tessellaris*). (Maiden in *Proc. Roy. Soc. N.S.W.* XLVII, 77, 1913).

RANGE.

The type comes from Papua, as we have already seen. It also occurs in the tropical parts of the mainland, from Western Australia to Queensland. In Queensland it extends further south.

WESTERN AUSTRALIA.

I refer to this species specimens from Careening and Vansittart Bays, North West Coast, *Allan Cunningham* (B. Fl. iii, 251, under *E. tessellaris*. I have a specimen presented by Kew).

Mr. W. V. Fitzgerald gives the following account of this species under the name of *E. tessellaris* :—

"Careening and Vansittart Bays (A. Cunn.) May and Lennard Rivers; near Derby, at Goody Goody, Cygnet Bay; near Wyndham (W.V.F.).

"Tree to 60 feet high; trunk to 30 feet, diameter $1\frac{1}{2}$ –2 feet; bark greyish, persistent and tessellated for a short distance up from the butt, and thence white and smooth, but oftener smooth and white almost to the ground, and giving off a white colouration when touched; timber pale-coloured (this only refers to the sap-wood—J.H.M.), and very brittle; branches often pendulous; filaments white.

"A 'Cabbage Gum,' a 'River Gum' of Kimberley. In good soil on the banks of watercourses or in moist sandy spots, usually overlaying clay slates or sandstone."

Mr. W. V. Fitzgerald wrote to me about this species in August, 1918 :—

" With reference to *Eucalyptus papuana* and it being found inland from Hall's Sound, I collected specimens of a *Eucalyptus* about 10 miles inland from Hall's Sound, which reached Mueller along with others just before his death. (He died in 1896—J.H.M.) They were obtained between the Ethel and St. Joseph Rivers. An entry in my diary dated 10th May, 1896, reads : " Passed over *Eucalyptus* and grass country. The *Eucalypts* apparently belong to the Port Moresby species, reach a height of 50 feet, with very crooked trunks, having a diameter not exceeding 2 feet. Occasionally a species of *Banksia* was seen. I take the *Eucalypt* to be *E. papuana* and the *Banksia* *B. dentata*."

Cygnnet Bay, King Sound, about 16 deg. 5. min. (W. V. Fitzgerald as *E. tessellaris*.)

Branches drooping, bark whitish, common about Derby, head of King Sound (Dr. C. H. Ostenfeld, No. 526).

Meda, near Derby (W. V. Fitzgerald, Nos. 371 and 378). May River (W. V. Fitzgerald). Both these localities a little north-east of Derby.

Goody Goody, near Derby (W. V. Fitzgerald, No. 306). These specimens have opposite leaves, which is rather common in this group of species.

Near junction of Lennard and Barker Rivers, West Kimberley (W. V. Fitzgerald, No. 1,544). Showing transit to *E. grandifolia*.

Flexible branches. Broome, Roebuck Bay (Dr. C. H. Ostenfeld, No. 528). 18 deg.

This appears to be the most southern locality known from Western Australia, and it may be mentioned that this is also the most southerly locality recorded for *E. clavigera*. It would be desirable to give the vicinity of Broome a good overhauling to assist in the elucidation of the *clavigera-grandifolia-papuana* group.

NORTHERN TERRITORY.

A thinnish, moderately tall tree. Bathurst Island (G. F. Hill, sending photo. of this tree).

Typical " White River Gum." Found near edges of permanent springs, about water-holes, clay pans, &c. The leaves are getting broad, say $1\frac{1}{2}$ inch. The juvenile leaves are thin, ellipsoid, say 6 inches long and 3 broad, with a petiole of $\frac{1}{2}$ inch. Near Middle Creek Jungle, 30 miles from Darwin (G.F. Hill, No. 446).

" White stem and branches, trunk 4 inches in diameter at ground, on dry stony country." Stapleton (G. F. Hill, No. 311).

" Water Gum." " Tree medium to large, erect, graceful. Leaf elongate, lanceolate. Bark white and smooth. Trees grown in moist places on alluvial with *Melaleuca* and *Pandanus*. Bark slightly frayed or peeling at base of trunk." Burrundie (Dr. H. I. Jensen, No. 362).

Additional note by Dr. Jensen :—

" My specimen (362) which I take it is near the type, as the tree is Papuan or North Queensland, and would, therefore, in the drier Northern Territory climate, seek the moist places, is willow-like in the drooping habit of the branches. It is a tall

graceful slender tree, often attaining a great size, over 50 feet high. Smooth white bark, occasionally peeling slightly at the base, narrow drooping leaves."

"The specimen outside the Mines Office at Darwin has a totally different habit, grows on a dry ridge, roughish bark half way up stem, leaves as in the Darwin *E. grandifolia* specimen and so on." No. 364 is here referred to.

I have already noted *E. grandifolia* in its two forms in the Northern Territory; see p. 188. There would appear to be no *E. tessellaris* in the Northern Territory, but it should be searched for.

McKinley River flats, Burrundie (Dr. H. I. Jensen, No. 386).

Locally called "Moreton Bay Ash." Woolngi, a gold-field a little south of Pine Creek (Dr. H. I. Jensen, No. 406).

Cullen River. Leaves getting a little large (Dr. H. I. Jensen, No. 408).

Borroloola. "Large tree, white stem." Buds and flowers. At head of Macarthur River, east side of Gulf of Carpentaria (G. F. Hill, No. 685). Quite typical.

Seventy miles from Camp No. IV, 28th June, 1911 (G. F. Hill, No. 392).

"On hillsides, 2 feet in diameter." Macdonnell Range, 23rd March, 1911. (G. F. Hill, No. 122).

Finke River (Revd. Hermann Kempe). "Ilumba" of the aborigines of the vicinity of the Macdonnell Range.

PAPUA.

1. Leaf of type (Patrick Reedy, No. 139. He was gardener to Sir William Macarthur, Camden Park, Menangle, N.S.W., and accompanied him on the "Chevert" expedition to New Guinea). From Melbourne Herbarium. The type came from the mainland of Papua, opposite to Yule Island, and 12 miles from the coast.

2. Leaves, for the most part broader than the type, with a sprinkling of hairs on the rhachis. The juvenile leaves broadly lanceolate, with the shortest of petioles. One of the puzzling forms between *E. papuana* and *E. clavigera*. Port Moresby (Prof. Baldwin Spencer).

QUEENSLAND.

This species is extensively distributed in Queensland, extending considerably to the south, but the precise range is uncertain. Some account of its distribution will be found in the note from *Proc. Roy. Soc. N.S.W.*, XLVII, 77, quoted at p. 193.

The following is an admirable account of its range and other details.

"Another Eucalypt of considerable interest seen around Alma-den was *E. papuana* F.v.M., (*E. tessellaris* var. *Dallachiana* Benth., or *E. clavigera* var. *Dallachiana* Maiden). A feature of these trees is that their leaves are often shiny and twisted, or crinkled, those on small saplings being usually very large, sometimes measuring 11 by 5½ inches, but in all cases smooth and petiolate. The bark on the main portion of the trunk is smooth and white, but in this locality there is sometimes a little roughness on the butt for a height of 6 or 8 feet, but in many cases the bark is white to the ground, and turns brown before peeling off. (Plate LVI, fig. 2). The timber is a very dark brown, and the fruits seem intermediate between those of *E. tessellaris* and *E. clavigera*, being up to 1 cm. long by 7 mm. in diameter, with pedicels of 3 to 4 mm. Neither buds nor flowers were obtained. These trees appeared to be quite distinct from those of

E. clavigera growing near. Trees of *E. papuana* were seen intermittently from Alma-den to Normanton, on the Gilbert, Flinders, Corella, and Cloncurry Rivers, and around Barcaldine, and were in most cases smooth and white to the ground, and known as Cabbage Gum.

"In the river country the Cabbage Gum is nearly always white to the ground, and is a very shapely and umbrageous tree, about 40 to 50 feet high, and undoubtedly seems to be worthy of specific rank. I was informed that in the lower Flinders district these trees withstood the drought of 1902 better than any other Eucalypt.

"It seems likely that the trees mentioned by Leichhardt (*op. cit.*, pp. 325, 351 and 355) as White-gum and Drooping White-gum are of this species." (R. H. Cabbage, in *Proc. Roy. Soc. N.S.W.*, XLIX, pp. 406-407, 1915.)

"White Gum." Jericho (W. of Emerald) on the railway line 164 miles west of Rockhampton (Crown Lands Agent, 1913).

"Desert Gum." "Cabbage Gum." "A smooth-barked tree, the outer bark, when falling away, coming off in chips, not in flakes or ribbons. It has much the appearance of *E. tessellaris*, but the leaves are larger and fleshier than those of that species. The tessellated bark, characteristic of *E. tessellaris*, is absent, except quite at the base, and then the rough bark is irregular in size and shape. Trees go to a large size, but timber not lasting." Emerald (J. L. Boorman). Mr. Blakely points out that the inflorescence is in a drooping or deflexed cyme.

West Rockhampton (W. N. Jaggard). Rockhampton, just inside the tropic (Amalia Dietrich; R. Simmons). "Has tessellated bark at butt, but leaves more fleshy, twigs more brittle, fruits larger and flowers more hid in the axillary umbels by the larger and more pendulous leaves. Fairly common at North Rockhampton on the flats to the foot of the ranges." (J. L. Boorman.) P. O'Shanesy gives the aboriginal names as "Bidhyulla" and "Dangalboora."

St. Lawrence, near Broad Sound in lat. 23-30 deg. (T. Tate).

Rockingham Bay (J. Dallachy, No. 109). 18 deg. 5 min.

With leaves varying from lanceolate and an inch broad (Chillagoe) to broadly lanceolate, 2½ inches broad (Kimberley, 1,544). Buds nearly spherical and with short pedicels. Chillagoe, Cairns Railway, 138 miles west of Cairns, North Queensland (E. Doran).

Stannary Hills (Dr. T. L. Bancroft, No. 310). I think these specimens are intermediate between *E. papuana* and *E. grandifolia*, with a bias towards the latter, and have a note on them at p. 191.

"Desert Gum." "It grows best on sandy flats and sand ridges; it is not plentiful. Single trees only are scattered through the forest, where Bloodwood grows. Bark rusty white, which is shed in patches. It is a good useful timber when aged. It is mostly sound and is not a favourite with white ants. It is our best foliage tree amongst a very inferior lot." Mirtna Station via Charters Towers. A few miles south-east of the crossing of the lines 21 deg. S. lat. and 146 deg. E. long. (Miss Zara Clark). Fruits very bell-shaped, but not quite ripe.

"Cabbage Gum or Pudding Wood." Reid River *via* Townsville (G. R. Skelton).

AFFINITIES.

1. With *E. clavigera* A. Cunn.

"The species seems distinct from *E. clavigera* in longer and narrower leaves with less prominent veins in thinner petioles, in less numerous flowers on shorter pedicels, and perhaps in the form of fruit." (Original description.)

"*E. papuana* may not really be distinct as a species from *E. clavigera* as pointed out formerly in *Descr. Notes on Papuan Plants* (the original description), but the tree from New Guinea is as yet imperfectly known, and we here are quite unacquainted with the characteristics of its bark, on which for due discrimination of Eucalypts so very much depends." ("Eucalyptographia" under *E. clavigera*.)

Undoubtedly there are close relations between *E. clavigera* and its allies. As between *E. clavigera* and *E. papuana*, see Plates 152 and 155. The juvenile leaves and bark of *E. clavigera* show a sufficient difference.

2. With *E. grandifolia* R.Br.

In *E. grandifolia* we have very large juvenile leaves, and a greater tendency to coarse lanceolate leaves in intermediate stage; long pedicels and larger fruits.

In *E. papuana* they are, generally speaking, broader, and with a somewhat different venation. Sometimes we have sessile flowers or with not very long pedicels. The "twisted" leaves are quoted by most observers and appear to occur in both *E. papuana* and *E. grandifolia*.

E. papuana F.v.M. and *E. grandifolia* R.Br. were considered by J. G. Luehmann to be varieties of *E. clavigera* (*Proc. Aust. Assoc. Adv. Science*, VII, 525). The juvenile foliage of *E. clavigera* sharply separates it from the other two species, but *E. papuana* and *E. grandifolia* are closely related to each other, and I believe I have produced sufficient evidence that they are distinct species. I think it is very probable that we have additional facts to glean in regard to the relations of all three.

3. With *E. tessellaris* F.v.M.

"The discrimination of the likewise closely allied *E. tessellaris* is less difficult" (than from *E. clavigera*. Extract from original description of *E. papuana*.)

"By samples of *E. tessellaris* from New Guinea from Rev. T. Chalmers, the transit seems established to *E. papuana*, which was described from scanty material of an aberrant form with broader leaves and longer flower stalks" (than *E. tessellaris*). ("Eucalyptographia" under *E. tessellaris*.)

I will refer to the differences between these species when *E. tessellaris* is dealt with in Part XXXVIII.

Explanation of Plates (152-155).

PLATE 152.

E. clavigera A. Cunn.

- 1a. Juvenile leaf; 1b, buds from a specimen collected by Allan Cunningham on the "North-west Coast," labelled "*Eucalyptus clavigera* A.C." by Cunningham himself, and presumably a portion of the type. Presented by Kew.
- 2a. Juvenile leaves (very small; I have some from the same place just as large as 1a); 2b, fruits; 2c, section of fruit, showing how sunk is the capsule. Nine-mile Ridge, near Wyndham, North-west Australia (W. V. Fitzgerald). Probably collected at no great distance from the type.
3. Mature leaf and panicle of buds. Meda, a little north-east of Derby, North-west Australia (W. V. Fitzgerald, No. 382).
4. Axillary cluster of fruits. "North Coast" (which means the Gulf of Carpentaria), Robert Brown, 1802-5. (From the British Museum.)
5. Large, almost sessile, juvenile leaf. Cullen Creek, *via* Darwin (Scientific Expedition of Prof. Baldwin Spencer, July, 1911).
- 6a. Juvenile leaves in the opposite stage from a flowering twig; 6b, anthers. Normanton, near Gulf of Carpentaria, Queensland (Mr. Ivie Murchie).

E. aspera F.v.M.

- 7a. Flowering twig, the leaves opposite and stem-clasping; 7b, flowers with smooth calyces; 7c, anthers; 7d, fruits (delicately veined). "Northern Territory." (From Melbourne Herbarium, and believed to be a portion of the type.)
- 8a. Twig, leaves only; 8b, twig with fruit. Tanami Tin Fields, Northern Territory (Dr. H. I. Jensen). It is believed that the two specimens came from the same plant.

PLATE 153.

E. grandifolia R.Br.

1. Juvenile leaf. Pine Creek Railway, Northern Territory (E. J. Dunn). Note its long petiole as compared with the sessile leaf of *E. clavigera* (Fig. 5, Plate 152).
- 2a. Two undulate leaves; 2b, flowers, showing opercula. "North Coast" (i.e., Gulf of Carpentaria). Robert Brown, 1802-4. The type.
3. Young fruit, with rim. Burrundie, near Darwin (Dr. H. I. Jensen, No. 352).
- 4a. Mature leaves (the specimens include some which cannot be distinguished from 2a); 4b, fruits. Stapleton, Northern Territory (G. F. Hill, No. 449).
- 5a. Buds (small); 5b, anthers. Darwin, Northern Territory (G. F. Hill, No. 342).

PLATE 154.

E. grandifolia R.Br.

- 1a. Juvenile leaf; 1b, mature leaf; 1c, fruits, rather small, urceolate. Darwin (Dr. H. I. Jensen, No. IV).
- 2a. Mature leaf. (Note how they vary in size); 2b, anthers. Darwin. (G. F. Hill).
3. Fruits. Stapleton, 60 miles south of Darwin (G. F. Hill, No. 447). Note that the fruits are cylindroid rather than urceolate.

PLATE 155.

E. papuana F.v.M.

- 1*a*. Broad mature leaf, buds, with hemispherical operculum; 1*b*, fruit. Near junction of Lennard and Barker Rivers, West Kimberley, North-west Australia (W. V. Fitzgerald, No. 1544).
- 2*a*. Narrow mature leaf, and buds with almost conical opercula; 2*b*, immature fruits; 2*c*, fruit, campanulate in shape, like those depicted in Fig. 6*d*. Meda, near Derby, North-west Australia (W. V. Fitzgerald, No. 378).
- 3*a*. Juvenile leaf; 3*b*, broad, mature leaf, with buds. Middle Creek, near Darwin (G. F. Hill, No. 446).
- 4*a*. Mature leaf, buds and flowers; 4*b*, fruit. Burrundie, Northern Territory (Dr. H. I. Jensen, No. 362).
5. Mature leaf. New Guinea (Patrick Reedy, Macleay "Chevert" Expedition). Portion of the type. Only a few leaves of the type are in the Melbourne Herbarium.
- 6*a*. Intermediate leaf; 6*b*, mature leaf and buds; 6*c*, anthers; 6*d*, campanulate fruits. Mirtna Station, *via* Charters Towers, Queensland (Miss Zara Clark).
- 7*a*. Mature leaf and buds; 7*b*, anthers; 7*c*, two fruits and one shown in plan. Rockhampton, Queensland. (Labelled *E. tessellaris*, var. *Dallachyana* by Benth. From Melbourne Herbarium).

The following species of *Eucalyptus* are illustrated in my "Forest Flora of New South Wales"* with larger twigs than is possible in the present work; photographs of the trees are also introduced wherever possible. Details in regard to their economic value, &c., are given at length in that work, which is a popular one. The number of the Part of the Forest Flora is given in brackets :—

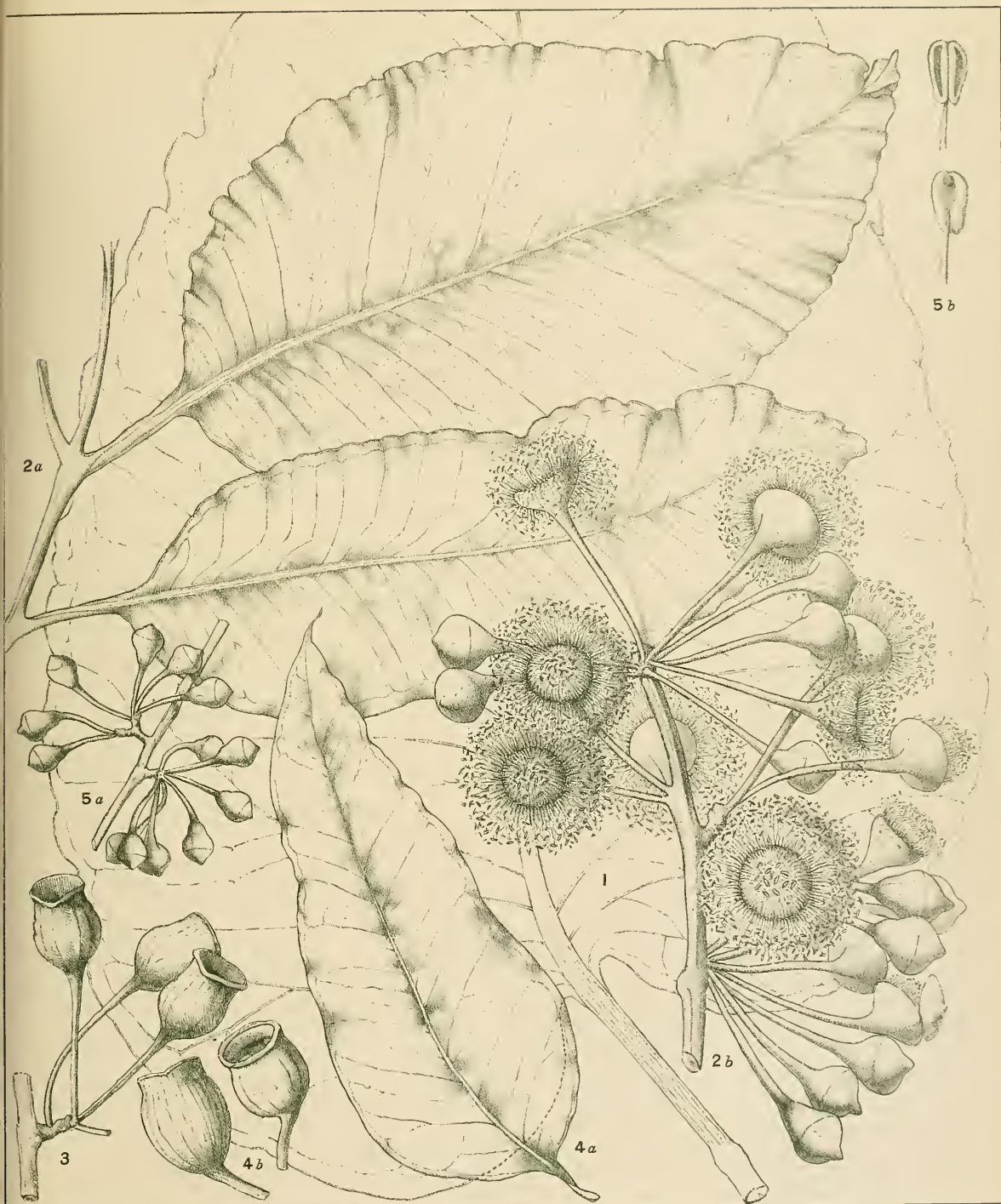
<i>acacioides</i> A. Cunn. (xlviii).	<i>melliodora</i> A. Cunn. (ix).
<i>acmenioides</i> Schauer (xxxii).	<i>microcorys</i> F.v.M. (xxxviii).
<i>affinis</i> Deane and Maiden (lvi).	<i>microtheca</i> F.v.M. (lii).
<i>amygdalina</i> Labill. (xvi).	<i>numerosa</i> Maiden (xvii).
<i>Andrewsi</i> Maiden (xxi).	<i>obliqua</i> L'Hérit. (xxii).
<i>Baileyana</i> F.v.M. (xxxv).	<i>ochrophloia</i> F.v.M. (l).
<i>Baueriana</i> Schauer (lvii).	<i>odorata</i> Behr and Schlechtendal (xli).
<i>Baueriana</i> Schauer, var. <i>conica</i> Maiden (lviii).	<i>oleosa</i> F.v.M. (lx).
<i>Behriana</i> F.v.M. (xlvi).	<i>paniculata</i> Sm. (viii).
<i>bicolor</i> A. Cunn. (xliv).	<i>pilularis</i> Sm. (xxxi).
<i>Boormani</i> Deane and Maiden (xlv).	<i>piperita</i> Sm. (xxxiii).
<i>Bosistoana</i> F.v.M. (xliii).	<i>Planchoniana</i> F.v.M. (xxiv).
<i>Caleyi</i> Maiden (lv).	<i>polyanthemos</i> Schauer (lix).
<i>capitellata</i> Sm. (xxviii).	<i>populifolia</i> Hook. (xlvii).
<i>Consideniana</i> Maiden (xxxvi).	<i>propinqua</i> Deane and Maiden (lxi).
<i>coriacea</i> A. Cunn. (xv).	<i>punctata</i> DC. (x).
<i>corymbosa</i> Sm. (xii).	<i>regnans</i> F.v.M. (xviii).
<i>crebra</i> F.v.M. (liii).	<i>resinifera</i> Sm. (iii).
<i>dives</i> Schauer (xix).	<i>rostrata</i> Schlecht. (lxii).
<i>fruticetorum</i> F.v.M. (xlii).	<i>rubida</i> Deane and Maiden (lxiii).
<i>gigantea</i> Hook. f. (li).	<i>saligna</i> Sm. (iv).
<i>goniocalyx</i> F.v.M. (v).	<i>siderophloia</i> Benth. (xxxix).
<i>hamastoma</i> Sm. (xxxvii).	<i>sideroxylon</i> A. Cunn. (xiii).
<i>hemiphloia</i> F.v.M. (vi).	<i>Sieberiana</i> F.v.M. (xxxiv).
<i>longifolia</i> Link and Otto (ii).	<i>stellulata</i> Sieb. (xiv).
<i>Luehmanniana</i> F.v.M. (xxvi).	<i>tereticornis</i> Sm. (xi).
<i>macrorrhyncha</i> F.v.M. (xxvii).	<i>virgata</i> Sieb. (xxv).
<i>maculata</i> Hook. (vii).	<i>vitrea</i> R. T. Baker (xxiii).
<i>melanophloia</i> F.v.M. (liv).	

* Government Printer, Sydney. 4to. Price 1s. per part (10s. per 12 parts); each part containing 4 plates and other illustrations.



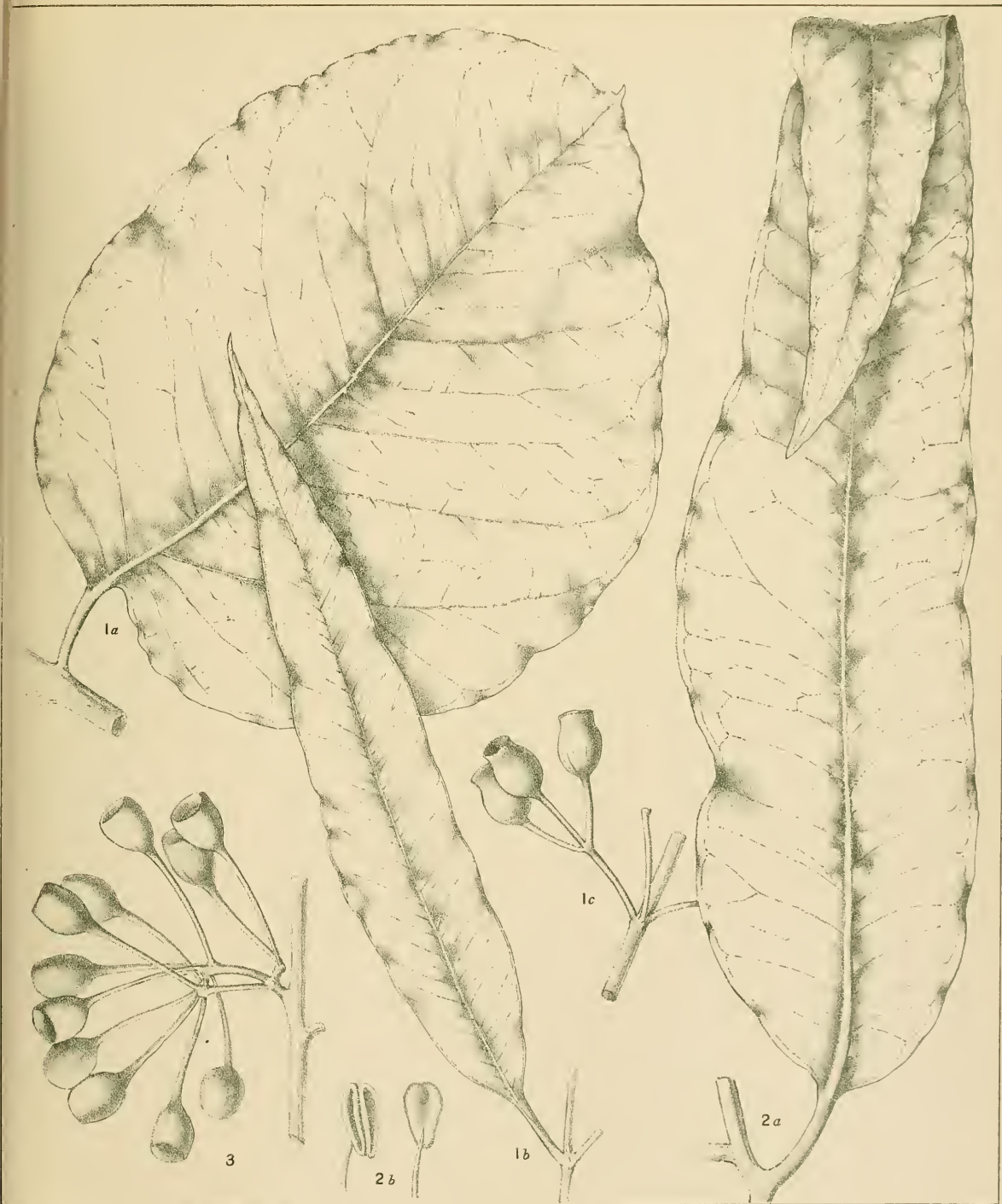
EUCALYPTUS CLAVIGERA A. CUNN. (1-6)

E. ASPERA F.v.M. (7, 8)



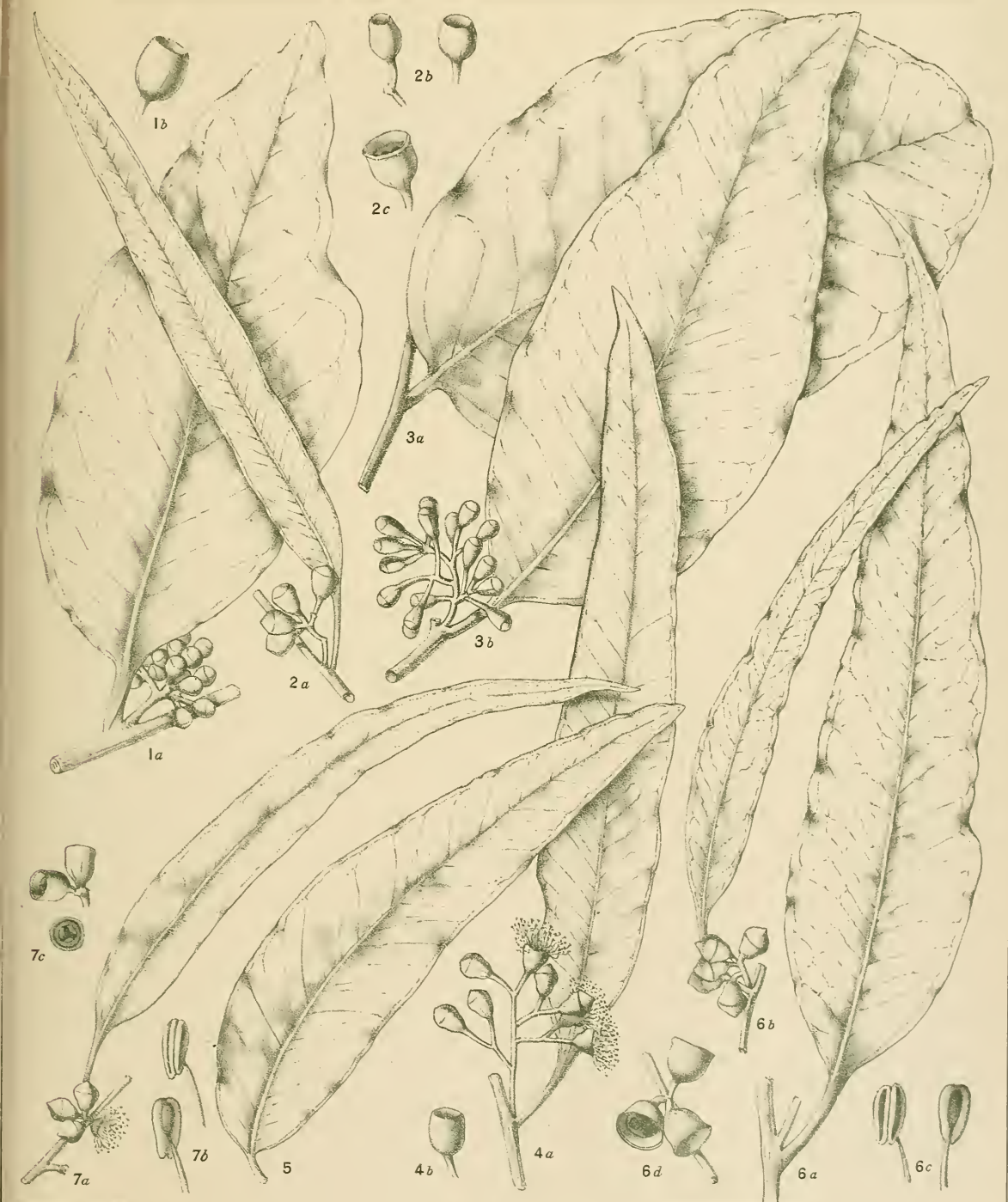
M. FLECKEN DELET. LITH.

EUCALYPTUS GRANDIFOLIA R.BR. [See Plate 154.]



H. Floeckner del. et lith.

EUCALYPTUS GRANDIFOLIA R.Br. [See Plate 153.]



EUCALYPTUS PAPUANA F.v. M.

DESCRIPTION.

CXCIII. *E. tessellaris* F.v.M.

In *Journ. Linn. Soc.* iii, 88 (1859).

FOLLOWING is a translation of the original description :—

A tree, branchlets somewhat terete, on the lower side angled and smooth on the upper.

Leaves alternate, somewhat short, petiolate, narrow-lanceolate, subfalcate, faintly penniveined, imperforate, *umbels* axillary and terminal, double or many, paniculate, 2-4 flowered, *peduncles* angular, the common one longer than the other peduncles, buds ovate, almost twice as long as the pedicel; *operculum* patella-shaped and obtuse, the *calyx-tube* slightly broader and much longer than the operculum; *fruits* truncate-ovate, ecostate, valves included.

Habitat in grassy places in the hills and plains, especially sandy-clayey areas from the district south-east of the Gulf of Carpentaria as far south as Moreton Bay. Flowered in November and December.

A medium or fairly large tree, the bark on the lower part of the trunk only persistent, the whole dirty-looking and ash-coloured, with numerous longitudinal and transverse cracks in the bark, forming unequal, somewhat tessellated, separable pieces. The upper part of the trunk, as well as the branches, is white and smooth. The branchlets and the leaves, as in many of the species, pendulous. Leaves for the most part 3-4 inches long, $\frac{1}{2}$ - $\frac{3}{4}$ inch broad, acuminate. The primary peduncles the same length as the petiole or twice as short. Fruit 4-5 lines long, slightly contracted towards the apex.

"Moreton Bay Ash," *Leichhardt's Overland Expedition* in many places, and of the colonists.

It was described by Bentham in B.Fl. iii, 251 (spelt *tessellaris*), and redescribed and figured by Mueller in the "Eucalyptographia."

Bark totally persistent on the lower part of the stem only, then dark-coloured, and by longitudinal and transverse fissures broken up into small angular masses; hence the specific name; the rest of the stem and branches ashy grey and smooth, rarely the whole stem so to the base. ("Eucalyptographia.")

For the limitations of the name "Moreton Bay Ash," usually applied to this tree, see below, p. 203.

The late P. O'Shanesy, Rockhampton district, Queensland, gives the aboriginal name as "Ghallgurria" or "Gallgurrie." It was called "Corang" by the aborigines of the Nogoa River, Queensland. Dr. Shirley gives me the name "Woonara" as in use by the Koolaburra tribe, between Taromeo and Nanango, Southern Queensland. (*Proc. Roy. Soc. Q.*, xii, 7.)

SYNONYMS.

1. *E. viminalis* Hook., non Labill.

2. *E. Hookeri* F.v.M.

1. *E. viminalis* Hook., non Labill., in Mitchell's *Journ. Trop. Austral.* 157 (1846).

Following is a translation of the original :—

Leaves alternate, glaucous, linear-lanceolate, with short, thin petioles, somewhat falcate, acuminate at both ends, reticulately veined, the lateral nerves near the margin, the racemes few-flowered and axillary, the calyx turbinate and narrowed into a short pedicel. A new *Eucalyptus*, which casts its bark in small angular pieces.

I have seen a specimen of the type; it bore the following label :—

"May 9, 1846. No. 146. Camp. XIV. Sub-tropical New Holland. Lieut.-Col. Sir T. L. Mitchell.
E. viminalis Hooker. 138. ('casts its bark in small angular pieces.')

2. *E. Hookeri* F.v.M.

Following is the original reference in *Journ. Linn. Soc.* iii (1859), 90 :—

Eucalyptus bicolor A. Cunn. To this also *E. gracilis* and *E. Hookeri* (*E. viminalis* Hook., in Mitchell's *Tropical Australia* non Labill.) are allied.

E. Hookeri is quoted by Bentham in B.Fl. iii, 251. This name ought never to have got into *Eucalyptus* literature at all, and the regret is the greater in that it makes it now more difficult to connect this honoured name with a species of *Eucalyptus*.

RANGE.

In describing the species, Mueller unfortunately gave the range (for the type) as from the Gulf of Carpentaria to Moreton Bay, namely, from end to end of Queensland, instead of describing his type from a specific locality.

Later, in "*Eucalyptographia*," and it was his own species, he records it "From near the south-eastern shores of the Gulf of Carpentaria (F.v.M.) to the vicinity of Moreton Bay (Dr. Leichhardt), extending to some of the central regions of Australia, thus occurring near the Finke River (Revd. H. Kempe), traced north-eastward to Fitzroy Island (C. Moore)."

The Finke River specimen is *E. papuana*, and the others are Queensland localities. It will be seen that later on he extended the range, northerly to Papua, while I show that southerly it is found over a considerable portion of New South Wales.

WESTERN AUSTRALIA.

Bentham quotes Careening and Vansittart Bays, N.W. Coast (Allan Cunningham). I have seen these specimens and they are *E. papuana*. See p. 194, Part XXXVII.

I have not seen indubitable *E. tessellaris* from Western Australia.

NORTHERN TERRITORY.

Bentham quotes "Islands of the Gulf of Carpentaria" *R. Brown*. I have not seen the specimens, and this locality seems too vague to base a record for the Northern Territory on; it might be off the North Queensland coast.

"Up to a height of 150 feet with a stem diameter of 3 feet" on the Finke River (Rev. H. Kempe). In "Eucalyptographia" as *E. tessellaris*, but it is *E. papuana*. (See p. 196, Part XXXVII.)

PAPUA.

"*E. tessellaris* extends to New Guinea, specimens fully responding to Australian ones having been received from the missionary, Revd. T. Chalmers." ("Eucalyptographia.") I have not seen them.

Use of the term "Moreton Bay Ash."

The term "Moreton Bay Ash," which was applied by Mueller to this species in the original description, following the use of the name in "Leichhardt's Overland Expedition" (to Port Essington), is not as exclusively devoted to *E. tessellaris*, as was at one time supposed. At least three species go under this name, *E. papuana* (see p. 196, Part XXXVII), while it is applied even more frequently to *E. grandifolia* R.Br. (see pp. 188-190).

The following are Leichhardt's references to "Moreton Bay Ash," and in the course of time collectors who know the various localities will say which species of Moreton Bay Ash Leichhardt saw. Some of the northern ones might have been *E. papuana*.

October 3, 1844, p. 6.—It is the prevailing tree with Bastard Box (probably *E. bicolor*) and Flooded Gum (probably *E. saligna* var. *pallidiverticis*).

At page 11 we have the same remarks. It does not appear to have been again noticed for over two months, when we have —

December 10, 1844, p. 68.—Growing in great abundance with Flooded Gum, *Erythrina*, *Tristania*, &c.

December 13, p. 75.—Vegetation from vicinity of Darling Downs common, Moreton Bay Ash very plentiful.

January 18, 1845, p. 112.—Tributary of the Mackenzie. Moreton Bay Ash very plentiful.

January 25, p. 121.—Flats with Moreton Bay Ash and Flooded Gum.

February 15, p. 154.—Bastard Box and Poplar Gum (perhaps *E. alba*) on a stiff clay. Narrow-leaved Ironbark (*E. crebra*?) and Moreton Bay Ash on lighter sandy soil.

March 27, p. 195.—Flats with silver-leaved Ironbark (*E. melanophloia*), Rusty Gum, Moreton Bay Ash.

April 9, p. 208.—Grew along the bergue of the river with *Grewia*, "its inseparable companion."

May 10, p. 250.—Flats, Moreton Bay Ash and Poplar Gum.

June 6, p. 283.—Small flats. Apple Gum (*E. clavigera*?) with Moreton Bay Ash.

July 28, p. 348.—Moreton Bay Ash and Bloodwood, in Saltwater Creek country.

August 25, p. 377.—Apple Gum, Box, and Moreton Bay Ash in a well grassed forest between lagoon and river.

Usually, on "flats"—this would indicate *papuana* (?).

"Lighter soil"—would indicate poor sterile sandstone soil.

QUEENSLAND.

Bentham quotes "South-east coast of the Gulf of Carpentaria, *F. Mueller*, which would be Northern Queensland, and also Queensland (without locality), *Bowman*; Fitzroy Downs, *Mitchell* (this would be on the Upper Muckadilla or Cogoon River a little to the west of Roma.—J.H.M.).

Port Denison, *Fitzalan*. (This is Edgecombe Bay.—J.H.M.)

Some localities by Mueller have been already quoted, and following are some Queensland localities in the National Herbarium, Sydney.

"A very graceful tree fairly tall, bark persistent at butt and cracked irregularly, deciduous on tips of branches. Wood dark brown, tough, inlocked in grain, heavy, sapwood light yellow." On ridges around Brisbane (J. L. Boorman).

Toowoomba North (Florence E. Yardley). Roma (Joseph Mayfield). Vicinity of Blackbutt Range (R. N. Jolly). Maryborough West (P. J. McGrath). Rockhampton (A. Thozet, A. Murphy, J.H.M.). Chillagoe (E. Doran). Reid River near Townsville (N. Daley).

"Practically smooth bark to ground. 40-50 feet. Called 'Cabbage Gum.'"
Flinders River, 60 miles south of Normanton. (R. H. Cambage, No. 3938.)

NEW SOUTH WALES.

Following are some New South Wales localities represented in the National Herbarium, Sydney. We require many more records yet, before its range in this State can be properly stated, but at present it has not been recorded south of the 31st parallel nor much east of 151 deg. E. longitude.

It is known as "Carbeen" at Narrabri, and is especially common at Pian Creek on the Walgett-road. It is an indication of good grazing country (Henry Deane, R. N. Lyne). Mr. Lyne says: "I only know of its presence over large tracts of country where shallow water (say 80 feet) is obtainable."

A tree of 70 feet, Parish Bobbiwa, County Jamison (Forester Gordon Burrow).

"Carbeen" or "Moreton Bay Ash." Handsome tree. Smooth limbs, base rough-barked, 3 feet 6 inches thick, 90 or more feet high. In sandy places between 40 and 50 miles north-west of Collarenebri (Sid. W. Jackson).

"Carbeen," Mt. Mitchell, Warialda district (W. A. W. de Beuzeville).

Howell, near Tingha (E. C. Andrews), which seems its coldest and most southerly locality at present.

AFFINITIES.

1. With *E. papuana* F.v.M.

This has been pretty exhaustively referred to at pages 193, 194, and 198 of Part XXXVII, also Plate 155, and I have not very much to add. Compare Plate 156 of the present Part.

E. tessellaris and *E. papuana* are closely related species, but are sharply separated by the narrow juvenile foliage of the former and the, usually, coarse adult foliage of the latter.

2. With *E. clavigera* A. Cunn.

See Part XXXVII, p. 184, and compare Plate 152 with Plate 156 of the present Part. *E. clavigera* is a spreading tree, reminding one of an *Angophora* (Apple-tree). *E. tessellaris* is more erect in habit, and, usually, its bark is more distinctly tessellated, and less fibrous. The foliage of *E. clavigera* is a contrast in coarseness with that of *E. tessellaris*, which is a narrow-leaved species at all stages. *E. clavigera* is usually a hairy species, while *E. tessellaris* is not. The anthers of the two species are similar.

3. With *E. trachyphloia* F.v.M.

This species shares in some of the characteristics of *E. trachyphloia*; but irrespective of the discrepancies of the bark, differs already in the uniform coloration of the leaves, which latter are also generally longer, are less pointed, and show more distinctly the venation; moreover, the inflorescence is less expanded; the lid is larger and separates by a more sharply-defined sutural line from the other portion of the calyx; the fruits are also of greater size, though less hard; the fertile seeds are much larger, comparatively more compressed and distinctly margined; but the last-mentioned characteristic is not well expressed in the lithographic illustration of *E. tessellaris* now offered, figure 9 having been drawn from unripe seeds. Again the plate of *E. trachyphloia* gives the venation of the leaves of that species too prominent, and would be apt in comparison with the lithogram of *E. tessellaris* to mislead. ("Eucalyptographia," under *E. tessellaris*.)

E. trachyphloia is a Bloodwood, and the differences between the two species will be again referred to when *E. trachyphloia* is arrived at.

DESCRIPTION.

CXCIV. E. Spenceriana Maiden.

In Ewart and Davies' *Flora of the Northern Territory*, 1917, p. 307.

ARBOR 50' attinens, trunco 2-3' diametro. Cortex rugosa, in lamellis secedens, non crassa. Lignum rubrobrunneum. Folia immatura tenuiuscula, pallida, late lanceolata, apicibus obtusa, 14 cm. longa. Venae secundariae tennes, numerosae, fere parallelae, angulum 60° cum costa media formantes. Folia matura immaturibus similia sed minora. Ramuli graciles, subteretes. Flores umbellis gracilibus, tennibusque, paniculati. Umbellae ad 7 flores, pedunculis pedicellisque longis filo similibus. Alabastra parva, clavata, opercula acuminata. Antherae poris dehiscentes (Porantherae). Fructus margine tenue et chartacea, ovoidei, circiter 6 mm. longi, valvarum apicibus distincte sub orificio depressis.

A tree of moderate height, attaining at least 50 feet, and a trunk diameter of 2 to 3 feet. Bark more or less rugged and flaky, particularly near the butt, such flakes being lenticular, thin and dry, and externally whitish to grey and even black. This rough bark extends to a variable extent over the trunk and larger branches. Bark not thick. Timber dark reddish-brown, interlocked, with a relatively thin, pale sap-wood.

Juvenile leaves.—Pale-coloured, equally green on both sides, broadly lanceolate, rather blunt at the apex, say 14 cm. long, with 6 cm. in greatest width, not thick, gradually tapering into a petiole of 2-2.5 cm. Midrib prominent, the secondary veins very fine and numerous, roughly parallel and meeting the midrib at an angle of 60 degrees. Intramarginal vein not far removed from the edge.

Mature leaves.—Thin, graceful foliage, very similar to the juvenile leaves, but smaller, and the intramarginal vein closer to the edge. Branchlets thin and almost terete.

Flowers.—In graceful, slender umbels, arranged in a paniculate manner, and not exceeding the leaves. Umbels with up to seven flowers, peduncles and pedicels long, terete, and almost thread-like. Buds small (about 5 mm. long), clavate, the calyx-tube gradually tapering into the slender pedicel. The operculum shorter than the calyx-tube and tapering to a fine point. Anthers with glands at top, filaments at base, and opening in pores (Porantherae).

Fruits.—Rim thin, frail, the whole fruit of papery texture and readily crushed by the fingers, ovoid, about 6 mm. long, the tips of the valves distinctly sunk below the orifice.

Type.—Burrundie, Northern Territory, 5th November, 1915 (Dr. H. I. Jensen).

In honour of Sir W. Baldwin Spencer, K.C.M.G., who on his scientific expedition from Port Darwin to the Roper River in July-August, 1911, and again in the following year, at my request brought excellent flowering material of the species.

At a risk of slight duplication, it may be well to draw attention to the fact that this species has fruits of papery texture, like *E. clavigera* and other members of the Angophoroideae, while it has anthers in pores, showing divergence from the *E. clavigera* series.

RANGE.

Northern Australia, using the term in a wide sense, that is to say, the Northern Territory and Northern Western Australia, and Northern Queensland (though with some doubt). In the Northern Territory it extends from near the coast to a considerable distance inland. Its range has not been fully ascertained.

WESTERN AUSTRALIA.

The following specimen is from north Western Australia :—

“*Eucalyptus* N.W.C.” (North-west Coast). Allan Cunningham in Hookerian Herbarium, referred to *E. drepanophylla* F.v.M., by Bentham (B.Fl. iii, 221).

NORTHERN TERRITORY.

Here it seems best developed. Specific localities are :—

Port Darwin (M. Holtze) in Herb., Melbourne, as *E. microtheca* F.v.M.

348. “Box Gum.” Just going off flower. Rapid Creek, near Darwin (near coast). (Dr. H. I. Jensen.) 6th November, 1915.

346. “Common Box Gum.” Burrundie, 5th November, 1915. (Dr. H. I. Jensen.) In flower, with a few ripe fruits. The type.

347. “Common Box Gum.” Growing outside Court-house, Pine Creek, 6th November, 1915. (Dr. H. I. Jensen.) In plump bud.

346, 347, 348. “This is the Coolibar or Box of the Northern Territory. The wood burns to a clean white ash, much appreciated for making dampers. Excellent, durable timber, but not white-ant proof. In general appearance the tree is such a typical Box, that I put it down as *E. microtheca*.” (Dr. H. I. Jensen.)

“Black Box. Rare.” Edith River, near Roper River, May–September, 1911. (W. S. Campbell.)

In flower, Darwin to Roper River, 1912. (W. Baldwin Spencer.)

422. “Box.” Woolngi (Fergusson Railway Crossing). 5th July, 1916. “The slate country where the slates are aluminous and fissile has Box preponderating. This Box is identical with my Pine Creek Box (sent under Nos. 346, 347, 348).” (Dr. H. I. Jensen.)

Stapleton (G. F. Hill, No. 456. Said by Mr. Hill to be same as 448.)

Usually about 7–8 inches in diameter, but goes up to 14 inches. Grows on low, stony foothills or grey soil gullies at foot of ranges on flats. Common in the locality. Stapleton (G. F. Hill, No. 448).

“Broad-leaved, otherwise indistinguishable from 448 and 449.” Stapleton (G. F. Hill, No. 457). The leaves, both juvenile and mature, are coarser than those of the normal form. See fig. 4, Plate 156. (G. F. Hill, No. 457.)

QUEENSLAND.

“Coolibah,” Reid River *viâ* Townsville (Nicholas Daley). This is in bud, flower and early fruit. I formerly looked upon it as *E. microtheca* F.v.M., but now have little doubt that it is *E. Spenceriana*.

AFFINITIES.

E. Spenceriana has affinity with *E. microtheca* in regard to anthers, and to *E. papuana* F.v.M. and allied species as regards fruits.

1. With *E. microtheca* F.v.M.

Mueller, who had apparently not seen fruits, labelled one specimen *E. microtheca*, and Dr. Jensen assumed that it was that species. *E. microtheca* is apparently comparatively rare in the Northern Territory. Reference to Plate 52 of this work shows that the two species are sharply different as regards the typical fruits, those of *E. microtheca* being very small, hemispherical, and having the valves very much exerted. At the same time, I have seen specimens (*e.g.*, Reid River, *via* Townsville, Queensland, Nicholas Daley, 24th February, 1912) which show evidence of slight transition in the fruits. The timbers of *E. Spenceriana* and *E. microtheca* appear to closely resemble each other.

2. With *E. papuana* F.v.M.

Undoubtedly the two species have affinity as regards their fruits, but their anthers are quite different, those of *E. papuana* being versatile, and having long parallel slits, with a comparatively large gland at the back. The flowers are larger and fewer in the panicle and have flat opercula.

The foliage of the two species has a general resemblance, but the leaves of *E. papuana* are more undulate, more irregular in outline, thicker, and the venation is coarser.

The timber of *E. papuana* is brown and not reddish, and the bark tessellated or smooth. *E. papuana* is closely related to *E. clavigera* A. Cunn.

3. With *E. Brownii* Maiden and Cabbage (*Proc. Roy. Soc.* xlvii, 215, 1913).

This belongs to the Porantheræ, and is described as a Box, two points of similarity to *E. Spenceriana*. But the leaves of *E. Brownii* are more narrow lanceolate, have glossy leaves and have more spreading venation. The inflorescence has very much shorter peduncles and pedicels, and the fruits have not papery walls as in *E. Spenceriana*.

4. With *E. drepanophylla* F.v.M.

I only mention this because of the inclusion of an imperfect specimen (North-west Coast, Allan Cunningham) under *E. drepanophylla* F.v.M., in B.Fl. iii, 221.

E. drepanophylla was even less known then than it is now. It is an Ironbark, and has not yet been found out of Northern Queensland.

5. With *E. brachyandra* F.v.M. See Part XXX of the present work.

In the texture and fine venation of the leaves. Those of *E. Spenceriana* are more elongated. In the terminal and axillary inflorescence, and in the number of flowers in the umbel (usually 4-7 in both species). In the blunt operculum of some forms of *E. Spenceriana*. In the form of the ripe and unripe fruits. *E. brachyandra* is smaller in all its parts.

DESCRIPTION.

CXCV. *E. Cliftoniana* W. V. Fitzgerald, n.sp.

ARBORESCENT; branchlets stout, cylindrical; leaves opposite, sub-opposite or alternate, narrow-lanceolate, straight or falcate, acuminate, tapering into the petioles, veins fine, very divergent, parallel and almost concealed, the intramarginal one confluent with the edge; flowers pedicellate, 3-5 together in an umbel of which several form short broad terminal panicles; peduncles and pedicels terete; calyx-tube broadly turbinate, very open; lid hemispherical, umbonate, much shorter than the tube. Stamens inflected in the bud; fruit hard and globular, smooth and ribless, contracted at the summit, the rim not thick; capsule deeply sunk; valves four; fertile seeds brown, terminating in a membranous wing; barren seeds wingless, small and narrow.

Height 30-40 feet; trunk to 15 feet; diameter 1 foot. Bark persistent on the stem and branches, dark-coloured, rough and longitudinally furrowed. Timber red, tough and hard. Leaves 4-5 inches long, petioles above $\frac{1}{2}$ inch. Pedicels $\frac{1}{2}$ inch or less. Calyx-tube 3-4 lines diameter. Filaments white. Fruit $\frac{3}{4}$ inch diameter. Fertile seeds 2 lines long, the wings 3 lines in length. "Desert Gum."

Affinity—*E. setosa* Schauer.

The specific name was given in honour of Mr. R. C. Clifton, Under Secretary for Lands, Western Australia.

RANGE.

Mount Anderson, Grant Range (W.V.F.). In sandy soil overlying sandstone. Extends to the desert country south of the Fitzroy River.

This species, so far as is at present known, is confined to the Kimberley region, north Western Australia. In addition to fragments from Mt. Anderson and Grant Range, I have seen fragments bearing Mr. Fitzgerald's labels, "Packhorse Range," "Summit of Bold Bluff."

AFFINITY.

1. With *E. setosa* Schauer.

I have only seen such material as I have figured, with a few duplicate leaves. In the accidents of travel and transit some material of *E. Abergiana* F.v.M. (of North Queensland) has got mixed with the *Cliftoniana* material, which has added to the confusion. We must therefore throw responsibility on the author, who alone stood before the tree and who described more material than anyone else saw. The "narrow lanceolate" leaves come away from *E. setosa*, although the fruits incline in that direction. The leaves incline to the Corymbosæ, but the globular fruits are a difficulty. At the same time the twig impresses me irresistibly that it belongs to the Corymbosæ. But I must admit that there is often an element of doubt in a species where the material is so scanty.

DESCRIPTION.

CXCVI. *E. setosa* Schauer.

In *Walpers' Repertorium* ii, 926 (1843).

FOLLOWING is a translation of the original :—

Schauer MSS.

Branches glabrous and branchlets terete, these with the peduncles and the calyx glaucous and hispid with reddish hairs.

Leaves crowded together, opposite, decussate, oval, sessile, cordate at the base, semi-amplexicaul obtuse, mucronate, glaucous-pruinose.

The terminal *corymbs* few-flowered.

Operculum depressed-hemispherical, acuminate, the *umbo* almost hidden amongst dense erect hairs.

Collected by Ferd. Bauer in New Holland.

It was described by Bentham (B.Fl. iii, 254) as follows :—

A small or moderate-sized tree, with a smooth ash-grey bark (*R. Brown*), the branchlets and inflorescence more or less hispid with rust-coloured bristles.

Leaves opposite, sessile, cordate orbicular and obtuse or ovate and almost acute, rarely above 2 inches long.

Umbels shortly pedunculate, several-flowered, forming short, terminal, rather loose corymbose panicles.

Pedicels often longer than the calyx.

Calyx-tube obovoid, often slightly eight-ribbed, about 3 lines long, more or less covered with bristles.

Operculum conical, shorter than the calyx-tube, often bearing a few bristles.

Anthers ovate, parallel-celled.

Ovary flat-topped, the style not dilated.

Fruit urceolate-globular, much contracted at the top, hard and woody, $\frac{1}{2}$ to $\frac{3}{4}$ inch diameter, the rim narrow, the capsule sunk. *Perfect seeds* large, broadly winged.

Later it was figured and described by Mueller in the "Eucalyptographia," the leaves there shown being more pointed than in the type.

Tree up to 40 feet; trunk up to 15 feet; diameter 1 foot; bark persistent on stem and branches, dark-grey, rough; timber reddish, moderately hard and tough; filaments white. In sandy soil. A "Cabbage Gum." (W. V. Fitzgerald, speaking of the north West Australian tree.)

The wood of this small or moderate-sized tree is of a dark brownish colour, subject to gum-veins, therefore only fit for using in the log; hard, strong and durable.

"It is a low shapely spreading tree about 30 to 40 feet high, and seems closely related to the Angophoras, having the general appearance of *A. subvelutina*, while its broadly-winged seeds show its affinity with the Bloodwood group of Eucalyptus. It is remarkable for its rusty hispid branchlets and inflorescence

and its sessile, opposite, cordate leaves. The bark of this tree is rough and somewhat scaly, and a note made when near one of the trees reads :—"Bark between that of an *Angophora* and *Eucalyptus robusta*." (R. H. Cambage, *Proc. Roy. Soc. N.S.W.* xlix, 426, 1915, speaking of the North Queensland tree.)

"Lid (operculum) rather tearing off irregularly and tardily than dropping suddenly and completely by a clear sutural dehiscence, remaining often for a while attached during the expansion of the flowers to one side of the orifice of the calyx-tube, as in other Bloodwood trees." (Mueller, "Eucalyptographia.")

The fruit of *E. setosa* is not happily drawn in the "Eucalyptographia." Without being actually inaccurate, it is not characteristic of that species, rather representing *E. ferruginea*.

For a note on the reflex lip of the fruit, see the reference to the Broome and Strelley River specimens, this page; for a note on the markedly urceolate shape of a very large fruit, see the Arnhem Land reference at page 212.

SYNONYM.

E. hispida R.Br. MSS. See below, page 212.

RANGE.

The type was collected by Ferdinand Bauer when he was with Robert Brown amongst the islands of the Gulf of Carpentaria.

It has since been ascertained that it occurs in north Western Australia, the Northern Territory, and Northern Queensland, *i.e.*, in the Australian tropics generally, but it seems to prefer situations not more than 100 miles from the sea.

WESTERN AUSTRALIA.

1. Broome (W. V. Fitzgerald, April, 1905, and July, 1906).
2. "Low Mallee-like Gum, bark adherent." Strelley River, North-West Australia (Dr. J. B. Cleland, 1908).

These are very similar; the Broome ones are drawn at fig. 8, Plate 158. The differences from other specimens of the species known to me are, only the sucker leaves hirsute. In *E. setosa* the whole plant seems to be usually hirsute. In these specimens the leaves are proportionately narrower than in *E. setosa*. The fruit is more sessile and the mouth is wider, more reflexed. It is 1 inch long. Of course, we must bear in mind that the available material in herbaria of *E. setosa* for the institution of comparisons is not very great.

It is represented by the following additional specimens in the National Herbarium, Sydney.

Lennard River; Mount Anderson (all W. V. Fitzgerald); south of Fitzroy River (Mayo Logue).

NORTHERN TERRITORY.

Specimens of the type, Robert Brown's 4782, collected by Ferd. Bauer and himself, "North Coast, Carpentaria, 1802-5," and labelled by Brown *E. hispida*, were distributed by the British Museum in the J. J. Bennett (1876) distribution as "*E. setosa* Schauer (*hispida* R.Br.)." The name, therefore, must be recorded, to save confusion, although it was never published with a description.

A specimen of *E. setosa* in Herb. Vindob. ex Herb. Bauer (Ferd. Bauer, del. No. 43 ?) bears also the name *E. hispida* Tausch.

Other Gulf of Carpentaria localities are :—

Sweer's Island (Henne).

The late Prof. Ralph Tate was in Arnhem Land, Northern Territory, in 1881, and he gave me some fruits labelled "*Eucalyptus Foelschiana* F.v.M., Arnheim (Arnhem's) Land, Ralph Tate." They are really *E. setosa*, but became mislaid because of the erroneous label. They remind one of the Broome, W.A., specimens (fig. 8d, Plate 158), but they are larger (being up to $1\frac{7}{8}$ inches long), more urceolate, and with pedicels up to $\frac{3}{4}$ inch long.

Then I have specimens from N. Territory, "north of 15°" (W. S. Campbell).

Bridge Creek, Darwin (Burkitt, from Melbourne Herbarium).

Foot-hills, Stapleton (G. F. Hill). Woolngi (Dr. H. I. Jensen). A pipy piece of a limb received with this specimen has flaky bark (of the Woolly Butt character).

Brock's Creek (Dr. H. I. Jensen, C. E. F. Allen's No. 304).

Pine Creek Railway (E. J. Dunn, R. J. Winters).

Scrubby tree, with stem of 6 or 7 inches in diameter. Tanami Tin-field (Dr. Jensen, No. 204 of C. E. F. Allen).

Camp iv, Northern Territory Survey, 29th June, 1911. A single fruit and leaves (G. F. Hill, No. 398).

Forty miles N.N.W. of Meyer's Hill, 2nd June, 1911. Up to 40 feet; rough stem. (G. F. Hill, No. 241a.) Fruits and leaves only. Fruits smaller and more glabrous than any I have previously seen. When complete material is available it may be worthy of consideration as to whether this form is worthy of indication as a variety.

QUEENSLAND.

It is growing in and around the town of Normanton, on a mixed siliceous and ironstone formation, and was not noticed to the eastward near Croydon or Georgetown (R. H. Cambage). Croydon (James Gill; J. A. C. Wilson, the latter from C. T. White).

Normanton, Gulf of Carpentaria (R. H. Cambage, No. 3933) ; also "A fairly common tree" (Ivie Murchie).

Twenty feet high, 10 inches in diameter, wood dark-brown, on sandy tableland at 1,400 feet. Prairie to Baronta, 30 miles east of Hughenden (R. H. Cambage, No. 3965).

Cape River (?Peter Johnson, No. 289). Mt. Elliott (E. Fitzalan). From Herb. Melb.

Lake Dunn Station. (From F. M. Bailey.) There is a Lake Dunn Station not far from Aramac.

AFFINITIES.

1. With *Angophora*.

The affinity of *E. setosa* to the *Angophoras* has already been touched upon.

Mueller ("Eucalyptographia") says: "The resemblance of *E. setosa* to species of *Angophora* is most striking, especially on account of the reddish or dark-brown stiff short hairs, which are most copiously developed on the branchlets and inflorescence; this renders their similarity in habit complete."

In the field, Mr. Cambage speaks of its general resemblance towards *Angophora subclutina*, and notes that the bark is "between that of an *Angophora* and *Eucalyptus robusta*." I will deal with the affinities of *Eucalyptus* and *Angophora* later.

2. With the *Corymbosæ*.

The fruit of *E. setosa* shows a strong affinity to the *Corymbosæ*, and Mueller ("Eucalyptographia") recognises this in the following words:—

Amongst its own congeners *E. setosa* must find a systematic place near *E. corymbosa*, *E. terminalis*, *E. dichromophloia*, *E. trachyphloia* and their allies, which all exhibit a similar imperfectly defined dehiscence of the calyx.

Mr. Cambage says, "its broadly winged seeds show its affinity with the Bloodwood group of Eucalypts."

3. With *E. aspera* F.v.M.

"*E. aspera* approaches this species (*E. setosa*) in the roughness of the branchlets and much in foliage, though its leaves are generally not so large and comparatively not so broad, but the smooth calyces with polished lid, the small fruits with sharp edge, and the seeds not provided with appendages, bring that species into much closer contact with *E. clavigera* and also *E. ferruginea*, except in the size of the fruit." ("Eucalyptographia" under *E. setosa*.)

If my readers will turn to Plate 152 (Part XXXVII) they will see that, as regards the leaves, there is a good deal of similarity between the two species, but as between the comparatively small, thin-walled, papery fruit of *E. aspera* and the large, woody, globular to urceolate fruit of *E. setosa*, the difference is very wide.

4. With *E. Foelschiana* F.v.M.

The two species have been confused, presumably on the fruit, which may be as urceolate in *E. setosa* as it is in the other species. The vestiture of *E. setosa* is, however, a character. The matter of the resemblance will be again referred to when *E. Foelschiana* is reached.

DESCRIPTION.

CXCVII. *E. ferruginea* Schauer.

In *Walpers' Repertorium* ii, 926 (1843).

FOLLOWING is a translation of the original:—

The whole (plant) rusty-scaly, branches and branchlets rigid, spreading; *leaves* coriaceous, opposite, oblong-lanceolate, shortly petiolate, caudate at the base, semi-amplexicaul, acuminate, penninerved, smaller veins removed (from the edge), undulate; the terminal *panicle* many-flowered, branches opposite, rather long and, with the peduncles, somewhat compressed; *umbels* 6-8 flowered; the *young buds* black, verrucose, covered with a white tomentum; the mature *calyx-tube* somewhat large, obovate-cyathiform, rounded at the base, shortly pedicellate, white and testaceous, variable (*i.e.* smooth on the margin and hairy in the centre); *operculum* coriaceous, depressed, slightly umbonate, much punctate, occupying the vertex of the calyx-tube. Ferdinand Bauer collected it in New Holland.

Bentham (B.Fl. iii, 251) described it in the following words:—

A moderate-sized tree, with a rough persistent dark grey bark (*F. Mueller*), the young branches and often the foliage more or less rusty-pubescent, or the branches hispid with a few stiff hairs or bristles, but sometimes quite glabrous. *Leaves* large, often 4 to 5 inches diameter, sessile, opposite, cordate, orbicular or oblong, mostly obtuse and sometimes undulate. *Flowers* rather large, the umbels in a dense terminal corymbose panicle, or in one specimen a single umbel axillary. *Peduncles* and *pedicels* short, terete. *Calyx-tube* very broadly campanulate, 6 to 8 lines diameter. *Operculum* broadly conical, shorter than the calyx-tube. Fruit ovoid, when perfect about 1 inch long and $\frac{3}{4}$ inch diameter, contracted towards the orifice, the rim narrow, the capsule deeply sunk. *Seeds* winged. *F. Muell.* in *Journ. Linn. Soc.* iii, 95; *E. confertiflora*, *F. Muell.* l.c. 96.

Mueller does not deal with it in the "Eucalyptographia."

The juvenile leaves are sessile, the mature leaves appear at first sight to be so, but are on a short pedicel usually covered by the very cordate base of the leaf.

Notes in regard to the leaves and fruits of this species will be found at page 217, and also at page 211 (under *E. setosa*).

SYNONYMS.

1. *E. undulata* F.v.M.
2. *E. confertiflora* F.v.M.
3. *E. floribunda* F.v.M. non Huegel.

1. *E. undulata* F.v.M. in *Journ. Linn. Soc.* iii, 95 (1859).

(The editor put it under *E. ferruginea* Schauer, with the foot-note, "Sent as *E. undulata* n.sp. by Dr. Mueller, but evidently the same as Schauer's plant,—A.B. (A. Black.).)

Following is a translation of the original :—

A tree, with strong terete branchlets, with puberulous, scabrous, glabrescent foliage, leaves opposite, rather thick, ovate-oblong, subsessile at the cordate base, spreading, undulate, obtuse or acuminate, opaque, imperforate, prominently and remotely penninerved, indistinctly reticulately veined, peripheral vein indistinct and distant from the margin, ... Fruits large, globoso-ovate, ecostate, contracted at the mouth, capsule finally freed from the calyx-tube, valves deltoid, included, seeds with long wings.

Habitat.—In elevated stony places (sandstone tableland), not rare through north and north-west Australia. Flowers in spring.

A medium-sized tree, with a wrinkled dirty ash-coloured bark, persisting all over the trunk. Leaves at the most 3–4 inches long, at the lower portion about $1\frac{1}{2}$ inch broad, covered with yellowish veins, rather scabrous with raised dots. Fruits about 1 inch long to $\frac{3}{4}$ inch broad, smooth at the mouth. The open valves scarcely touching the edge of the calyx-tube. Seeds all winged; the wings of the fertile ones ovate or deltoid, often 3 lines long. Cotyledons foliaceous and convolute. Albumen none. Radicle short, cylindroid below.

This species approaches *E. ferruginea* and *E. floribunda*.

2. *E. confertiflora* F.v.M. in *Journ. Linn. Soc.* iii, 96 (1859).

Following is a translation of the original :—

A tree, branchlets terete and, as well as the leaves, scabrous, leaves opposite, ovate, or ovate-lanceolate, acute, subcordate at the base, stem-clasping, sessile, prominently penninerved, veined, opaque, imperforate, lateral umbels axillary and the terminal ones crowded in a many-flowered head, the pedicels terete, two or three times longer than the calyces and peduncles; calyx-tube obconical, exangular, three times longer than the smooth, patella-shaped, apiculate operculum, fruit campanulate.

Hab.—From the Victoria River to the Gilbert, in dry grassy places.

Flowers in October and November.

A medium-sized scrubby tree. The outer layer of bark dirty and ash-coloured, persistent on the lower part of the trunk, separating in small pieces, the upper part of the trunk and the branches smooth and whitish, the young branchlets also hoary-brown. Leaves mostly $2\frac{1}{2}$ –4 inches long, $1\frac{1}{2}$ –2 inches broad, sometimes acuminate, the oil-bearing glands not conspicuous, the primary peduncle solitary, short or very short, resolved into many secondary somewhat terete unequal peduncles. Pedicels slender, $\frac{1}{2}$ –1 inch long. The calyx-tube 3–4 lines long. Operculum shiny, a little narrower than the tube.

It is very closely allied to *E. ferruginea* Schauer.

3. *E. floribunda* F.v.M. non Huegel. (*Journ. Linn. Soc.* iii (1859), 96.)

Same as *E. confertiflora*, a name substituted by R. Kippist, who attached the following note :—"Sent by Dr. Mueller under the name of *E. floribunda*, which is pre-occupied; the *E. floribunda* of Hügel being evidently quite distinct.—(R.K.)." (*E. floribunda* Hügel, in *Lehm. Pl. Preiss.* i, 128, is a synonym of *E. marginata* Sm.)

There is a specimen labelled "*Eucalyptus floribunda* Tausch, Ferd. Bauer, Herb. Bauer" in Herb. Vindob., which is *E. ferruginea* Schauer.

RANGE.

The type came from an island in the Gulf of Carpentaria. The original description says "Ferdinand Bauer collected it in New Holland." Mueller found the same species from the Victoria River to the Gilbert River (under *E. confertiflora*). entham adds, Copeland Island, North-west Australia, Allan Cunningham.

In other words, it comes from the extreme north of Australia, extending from north Western Australia through the Northern Territory. It is a little known species, and search will doubtless greatly extend its known range. I have submitted imperfect evidence that it may belong to South Australia, at no great distance from the Northern Territory border.

The timber and bark of a tree are important in the definition of a species, and it would be very desirable if there could be obtained short logs (say a foot long) of all the Northern Territory species. Bearing in mind their friable character, the barks should be tightly lashed round with sacking before beginning to cut them with a saw or an axe.

WESTERN AUSTRALIA.

Copeland Island, North-west Coast (Allan Cunningham).

NORTHERN TERRITORY.

I have seen, in addition to the type in the Vienna Herbarium, specimens from J. J. Bennett's British Museum distribution of 1876, and labelled "4781. R. Brown. Island, Carpentaria, 1802-5." These are co-types, but with most of the leaves more lanceolate than in the type. I have it also, "Medium sized tree," Glencoe Station, Arnhem's Land. (N. Holtze, from Melbourne Herbarium), and—Sandstone Ranges near Western Creek, Northern Territory, 16th February, 1912. Rough scaly bark. Buds and flowers only (G. F. Hill, No. 778).

(?) SOUTH AUSTRALIA.

In the collections of the Elder Exploring Expedition, Wa-Wee Rockhole (Richard Helms, 24th May, 1891), are some fruits (I suppose there must have been leaves collected, but I have never seen any), some of which have been distributed under the name "*Eucalyptus tessclaris*" (in Mr. Helms' handwriting), evidently a slip for *E. terminalis* F.v.M. recorded in *Proc. Roy. Soc. S.A.* xvi, 358.

The fruits have a smooth surface, and are of precisely the shape and size of specimens from Glencoe, Northern Territory, figured at 4b, Plate 159 (*E. ferruginea*). They are certainly not *E. terminalis*. The localities for "*E. terminalis*" quoted (*op. cit.*) are, *South Australia*, Mount Goolwa (C. 6), Everard Range and Wa-Wee Rockhole; *West Australia*, Cavenagh and Barron Ranges, and between them in patches.

As I have only seen the Wa-Wee Rockhole specimens, I cannot say to what species the specimens from the other localities should be attributed.

On the 24th May, 1891, the expedition (*Journal*, p. 21) was a stage from the Arcoelinnia Well, having left the Warrina Railway Station (near Oodnadatta) on the 1st instant, and proceeded *viâ* Arkaringa Creek.

On this imperfect evidence I suggest that *E. ferruginea* may occur in South Australia (near the southern boundary of the Northern Territory). It is not an impossible locality, and I hope that collectors will give their further attention to the trees of the Territory.

AFFINITIES.

1. With *E. setosa* Schauer.

Mueller does not refer to *E. ferruginea* in "Eucalyptographia." Bentham (B.Fl. iii, 198) gives the key:—

Leaves opposite, sessile, cordate.	Branchlets rusty-pubescent.	Leaves
large.	Fruit above 1 inch long	 <i>E. ferruginea</i> .
Branchlets and calyx bristly.	Leaves small.	Fruit $\frac{1}{2}$ to $\frac{3}{4}$ inch long
		 <i>E. setosa</i> .

Turning to *E. ferruginea*, leaves "large" in the type mean $4\frac{1}{2}$ inches long and a third of that wide. I have leaves from Glencoe $6\frac{1}{2}$ inches long and half that wide. The Glencoe fruit, the only one I have personally measured, is ovoid and an inch long.

In *E. setosa* the leaves are small only by comparison—under 2 inches and $1\frac{1}{2}$ wide in the portion of the type accessible to me. In the Northern Territory specimens I have seen leaves, both juvenile and adult, $3\frac{1}{2}$ inches long, and the former more than 2 inches broad. Fruits I have seen up to an inch long, but they are urceolate-globular, while those of *E. ferruginea* are ovoid.

2. With *E. Torelliana* F.v.M.

E. ferruginea seems to connect with the Corymbosæ through *E. Torelliana*.

DESCRIPTION.

CXCVIII. E. Moorei Maiden and Cabbage.

In *Proc. Linn. Soc. N.S.W.* xxx, 191 (1905).

FOLLOWING is the formal description :—

Syn. *E. stellulata* Sieb. var. *angustifolia* Benth., B.Fl. iii, 201. See also further synonymy in Maiden's "Critical Revision of the Genus *Eucalyptus*," v, 129, together with figs. 5a, 5b, and 6 of Plate 25.

An erect, rather slender shrub of up to 10 or 12 feet in height, with a stem diameter of 2 to 4 inches. It forms dense masses of small area, reminding one somewhat of a whipstick Mallee, but lacking the root stockiness of that form of *Eucalyptus* growth.

Juvenile leaves narrow-lanceolate, glaucous blue, the plant sometimes flowering while still in the opposite-leaved stage. Leaves profusely dotted with oil-glands.

Mature leaves.—"Leaves narrow, very thick and smooth, scarcely showing the venation" (Benth.). Shiny on both sides; the tips of the leaves often hooked.

Buds arranged in stellate clusters with longish sharply-pointed opercula. Opercula sometimes red in fresh specimens.

Flowers in dense heads of four or five to ten and even more; anthers small and reniform. Borne in profusion in the axils of the leaves.

Fruits in dense heads, say half an inch in diameter. The common peduncle absent or very short; the pedicels always wanting. The individual fruits of the size of a peppercorn, smooth (often dotted when fresh), rim narrow, and valves always sunk.

Bark smooth, with the outer bark peeling off in ribbons.

Timber pale, nearly white.

It is named in honour of the late Charles Moore, for many years Director of the Botanic Gardens, Sydney.

Besides the figures already referred to, it is figured at D and E, Plate 54, Vol. ii, of my "Forest Flora of New South Wales."

RANGE.

It would appear to be confined to New South Wales. The type came from the highest parts of the Blue Mountains (Blackheath). It is more or less plentiful from Wentworth Falls to Mount Wilson.

The nearest southern locality I know is Talwong, 5 miles as the crow flies from Tallong, but on the opposite side of the Shoalhaven, and said to be rare locally.

5-8 feet. Currockbilly Mountain, near Braidwood, Mongarlowe near Braidwood (J. L. Boorman).

Following is a form intermediate between *E. Moorei* and *E. stellulata*. "A Mallee up to 10 feet high. 1-5 inches in diameter, bark smooth, pale grey. Suckers broader than the type of *E. Moorei*." On eastern side of Great Dividing Range, head of Tuross River, about 16 miles easterly from Nimitybelle (R. H. Cambage, No. 1981).

Extended inquiry will find many more additional localities on the Southern Tableland, and I should be surprised not to find it on the Northern Tableland.

AFFINITIES.

1. With *E. stellulata* Sieb.

This is very close, and it has been long looked upon as a variety of that species. The forms are, however, sharply separated by the broad juvenile foliage of *E. stellulata*. The mature foliage of *E. stellulata* is also, as a rule, much broader, while *E. stellulata* attains the dignity of a medium-sized tree.

2. With *E. stricta* Sieb.

Its affinity to the narrow-leaved form of *E. stricta* Sieb., has already been indicated by Bentham (B.Fl. iii, 201) (see figures 12 and 13a, Plate 43 of this work), and, when mature leaves are alone available, it is very difficult, and perhaps ordinarily impossible to distinguish the two species. The juvenile leaves, buds and fruits, however, sharply separate them.

[No figure of *E. Moorei* is necessary in this Part, from what has been said.]

DESCRIPTION.

CXCIX. *E. dumosa* A. Cunn.

Schauer in *Walpers' Repertorium* ii, 925 (1843).

IN Part IV, page 97, of the present work I had followed Mueller in looking upon *E. dumosa* as a variety of *E. incrassata* Labill., but I now think that Bentham's view in looking upon it as a distinct species, although debatable, is worthy of restatement. Bentham (B.Fl. iii, 230) gave the first description in English. For the original description, and the history of the species, see Part IV, page 97, of the present work. It is most usually separated from *E. incrassata* by its ribbed operculum, but it is closely related to that species. See also page 223.

Mr. J. M. Black gives the aboriginal name of "Gi-lja" as current at Murat Bay, South Australia. Mr. C. E. Lane-Poole says it is known as "Mirret" or "Ribbon-tree" in Western Australia.

It is figured at Plate 16 of the present work, and juvenile foliage of the species from Wyalong, N.S.W. (at no great distance from the type locality), is shown at fig. 1, Plate 19.

The term Mallee as applied to this species, is sometimes modified by authors.

VARIETIES.

1. Var. *conglobata* (R.Br.) Benth.

This is illustrated at Plate 17, Part IV of the present work. At top of page 107 we have the Port Lincoln, South Australia, localities, and Bay 9 is Memory Cove and Bay 10 is Port Lincoln. See pages 107 and 108 of my "Sir Joseph Banks, the Father of Australia."

It is found also in Western Australia. It occurs not un plentifully at Kalgan Plains, Hopetoun and Esperance. Specimens from the two latter places have the fruits unusually large and with the rim well defined (Maiden in *Journ. W.A. Nat. Hist. Soc.*, Vol. iii, Jan. 1911).

So that we know it from near Albany in the west to Port Lincoln in the east, a distance of 1400 miles, and it does not appear to have been recorded from intermediate localities or places much inland.

Principally owing to the sessile character of the inflorescence, there is some justification for the view that it may perhaps be looked upon as a separate species, and I will refer to the matter later (not in this Part).

Its fruits may be compared with those of *E. annulata* Benth., fig. 3, Plate 145, with its hemispherical calyx-tubes and exert valves.

2. Var. *scyphocalyx* F.v.M.

This has only been found at Eyre's Relief Camp, Great Bight.

It is figured at 5a, Plate 13 of the present work, and I have expressed the opinion that it is near typical *E. incrassata* Labill. Benth. (B.Fl. iii, 230) says, "it approaches in some measure *E. gomphocephala*," but that would not apply to my specimen, apparently the type. See Part IV, page 97, of the present work.

Var. *punctulata* Benth. and var. (?) *rhodophloia* Benth., I have referred to at Part IV, page 98. In the present state of our knowledge concerning these plants, it is very uncertain as to whether they are really varieties of *E. dumosa*.

RANGE.

The type came from New South Wales (Wyalong district), as indicated in page 98, Part IV of the present work. It is a species of comparatively low rainfall, and it extends westerly to coastal Western Australia.

NEW SOUTH WALES.

To the localities given at page 108, Part IV, the following may be added :—

Bygoo-road, Ardlethan (R. H. Cabbage, No. 4247). North-west side of Lake View basin, 15 miles from Griffith (W. D. Campbell). "Box Mallee," West Wyalong (F. W. Wakefield). "Tall Mallees of 20-40 feet, the clumps usually have 6-8 stems all of equal size. Whole plant more or less glaucous in appearance." Yalgogrin (J. L. Boorman). Barmedman to Wyalong. Timber pale coloured to pale brown (Rev. J. W. Dwyer, No. 483).

Lake Cudgellico, Rev. (now Bishop) J. W. Dwyer.

Nymagee (J. L. Boorman). "A large shrub or small tree of 8-15 feet. Much branched, but shows little of the Mallee habit, as it has a distinct stem, which is about a foot in circumference. Bark of a scaly nature and of a dark brown colour, falling off in irregular-shaped patches, the inner bark being bluish-white or straw colour. Tips of branches deep brown and shining. Coppices freely. Grows in dry gravelly places." Cobar (J. L. Boorman). Nyngan-road, Cobar (L. Abrahams). Mount Hope (J. L. Boorman).

"Bull Mallee," 30 feet high. Gunbar (Hay to Hillston) (C. J. McMaster).

"White Mallee." Timber pale brown, Barham (G. S. M. Grant, Assistant Forester Chanter).

VICTORIA.

The following localities may be added to those given in pages 107 and 108, Part IV :—

Kerang (J. Blackburne). "Tree about 30 feet high. Three or four stems from one root, stems up to a foot in diameter. Bark persists at bottom of tree. Remainder of stem clear greenish brown." Bumbang (J. Blackburne, Sept., 1908).

"Red (?) Mallee," Mount Wycheproof (Rev. W. W. Watts, No. 243). Kaneira (Rev. W. W. Watts, No. 644). "White Mallee" Sea Lake (C. French, Jr.). "Forming with *E. oleosa* the major portion of the Mallee growth. Height up to 40 feet in favourable localities, diameter up to 8 inches and over. On the flats or flatter ground, rarely ascending the sand hills below their lower slopes, especially where the country is composed of a succession of sand hills with flatter ground between. Fairly uniform in type." Narrung, Euston, Mildura (W. S. Brownscombe).

Nhill, with conical pointed operculum (W. S. Brownscombe).

SOUTH AUSTRALIA.

The following localities may be added to those given at page 106, Part IV :—

River Murray, chiefly 15 miles east of Morgan (Dr. J. B. Cleland). Six miles north-east of Mannum, on Murray River. On limestone country in a dry rocky creek (W. Gill). Monarto South (Dr. J. B. Cleland). Murray Bridge (J.H.M.).

Roseworthy College, near Gawler (Prof. A. J. Perkins).

"Chindoo Mallee." Minnipa, Eyre's Peninsula (W. J. Spafford).

The following are West Coast localities :—

North of Murat Bay (J. M. Black). Murat and Denial Bays (Dr. R. S. Rogers). Fowler's Bay, approaching var. *angulosa* (Dr. R. S. Rogers). This is on the Great Australian Bight and the nearest locality I have seen it to Esperance in Western Australia.

WESTERN AUSTRALIA.

The following localities may be added to those at page 105, Part IV :—

Esperance (L. L. Cowen). Also at 9-mile Tank, near Hopetoun, and Desmond, near Ravensthorpe (J.H.M.). On the Kalgan Plains (J.H.M.). Growangerup, 30 miles east of Broome Hill (W. C. Grasby).

"Large shrub, grows on sand-plains. Called Whipstick Mallee." Cowcowing (M. Koch, No. 990).

Watheroo Rabbit fence (M. Koch, No. 1608).

At Dongarra, not far from the beach, is a dense growth of slender White Gums, ribbony at butt, which reminds one of dense Mallee, but not true Mallee, 20-25 feet high, trunk 4 inches diameter. Wood very tough, a little brown at heart. Operculum a little ribbed. Broad coarse suckers. Glaucous buds. It is very close to typical *incrassata*, certainly a connecting link (J.H.M.).

Port Gregory (already quoted p. 105) is a little further to the north, and remains the most northern coastal locality.

AFFINITIES.

1. With *E. incrassata* Labill.

In Bentham's Key (B.Fl. iii, 194) in a sub-subseries in which the leaves and fruit are alike,

Operculum obtuse or umbonate, much shorter than the calyx-tube.

Leaf-veins inconspicuous. Peduncles not much flattened *E. dumosa*.

Operculum rostrate, often longer than the calyx-tube. *E. incrassata*.

Look at Plate 16, Part IV, and at the extreme right-hand drawing (*dumosa*) of Mueller's "Eucalyptographia" drawing of *E. incrassata*, and see what value is to be given to the above description of the operculum in *E. dumosa*. I do not attach much importance to "leaf veins inconspicuous." The character "Peduncles not much flattened" (compare Plates 16 and 13, and also specimens since seen) applies at least as much to *E. incrassata* as to *E. dumosa*. The peduncle is terete or thereabouts in our New South Wales and Victorian specimens of *E. dumosa*. It is flat in the South Australian and in two specimens from Western Australia; all the other Western Australian specimens are similar to New South Wales ones.

The peduncle of *E. incrassata* var. *angulosa* is short and thick or flat. We have intermediate specimens with longer peduncles.

The fact of the matter is that Bentham's specimens of *E. incrassata* (B.Fl. iii, 231) refer largely to var. *angulosa*, while under *E. dumosa* he has a wide collection of varieties, and, in one case (Blue Mountains), mixed material.

The identification of *E. incrassata typica* depends primarily on Labillardière's imperfect and poor drawing (reproduced at fig. 1, Plate 13, Part IV), and the identification of Drummond's 3rd Coll. No. 65 (figs. 2a, 2b, Plate 13). In other words, is Drummond's specimen conspecific with *E. dumosa* as well as *E. incrassata*? It seems to me that Miss Floekton's drawings (to say nothing of additional material) prove that the fruits of *E. incrassata* and *E. dumosa* are identical. Much has been permitted to rest on the operculum. We have it pointed in fig. 2c, Plate 13 (*incrassata*), in 3a, Plate 15 (*dumosa*), and transition forms in the *dumosa* Plate (16). It is a shaky character.

Returning to Mueller's "Eucalyptographia," he speaks of *E. dumosa* representing the "small flowered state (of *incrassata*) with generally narrower leaves, only faintly furrowed and ridged calyces, short-pointed lid, and scarcely dilated [this is wrong.—J.H.M.] umbel-stalks." At all events he believed that *E. incrassata* and *E. dumosa* are conspecific.

Is *E. dumosa* A. Cunn. specifically different from *E. incrassata* Labill. ?

Frankly I do not think the present state of our knowledge justifies our taking a contrary position, but until we know more about Drummond's 3rd Coll. No. 65, collect it again, and especially note its habit and get bark, timber and juvenile leaves, the

matter is not settled to the point of legal proof. I have expressed myself pretty strongly at the bottom of page 97, Part IV, but there is a certain advantage in stating a case both ways.

In Part IV we have the case stated as *E. incrassata* var. *dumosa*; in this Part as *E. dumosa*. At the present moment the evidence seems to point to the view that *E. dumosa* cannot be usefully separated from the typical conoid-operculumed *E. incrassata*, while *E. incrassata* var. *angulosa* has even more claims to be considered a distinct species than *E. dumosa* has.

The revisionary statement of the case in this Part will, I confidently expect, cause Western Australian botanists and collectors to endeavour to ascertain all that there is to be known about Western Australian forms, and other botanists to contribute useful information which has become available since the publication of Part IV (fifteen years ago).

2. With *E. oleosa* F.v.M.

It is occasionally very difficult to discriminate between the two species on herbarium material, unless anthers be available, when it will be seen (compare Plate 66, Part XV) that the two species are very different. The operculum of *E. oleosa* is as a rule elongated, the calyx-tubes more ovoid, and the tips of the valves more attenuate. The colour of the timber is reddish, that of *E. dumosa* being brown. *E. oleosa* as a rule goes by the name "Red Mallee," and *E. dumosa* "White Mallee."

DESCRIPTION.

CC. E. torquata Luehmann.

In *Vict. Nat.* xiii, p. 147 (1897).

FOLLOWING is the original description :—

Leaves petiolate, lanceolate, slightly oblique at the base, about 4 inches long, $\frac{1}{2}$ to $\frac{3}{4}$ inch broad, coriaceous, the lateral veins oblique, but hardly visible except under a lens, of a dull greyish-green colour on both sides. *Peduncles* axillary or lateral, slender, nearly 1 inch long, bearing an umbel of about seven flowers. *Pedicels* as long as the peduncle, slender, mostly somewhat quadrangular. *Calyx* about 4 lines long, the base abruptly dilated into a ring with seven to ten prominent vertical ridges, the upper portion turbinate or nearly cylindrical, slightly streaked, the rim narrow. *Operculum* with a basal protuberance similar to that of the calyx, the upper part forming a narrow cone fully 3 lines long. *Stamens* all fertile, 4 to 6 lines long, the filaments of a reddish-orange colour; anthers rather large, truncate, and broader on top than at the base, opening by longitudinal parallel slits. *Ovary* five-celled. *Fruit* not seen.

Although only a single specimen of this species is available, I have ventured to submit a description of it on account of the most singular dilatation of the calyx. It seems to have the greatest affinity to *E. incrassata*, especially as regards the anthers. It also bears some resemblance to *E. decurva*, but that species has very small, nearly globular anthers.

I described the fruit at Part IV, page 109, of the present work, and gave a figure of it, and some details, at fig. 6, Plate 13, of the present work. A photograph of the tree is shown at page 120 of the same Part.

The describer speaks of the filaments as reddish-orange. I have never seen such a colour, spontaneous or cultivated, only pink of various shades—*i.e.*, of the crimson, not the scarlet series.

Mr. E. H. Bailey, of Perth (in 1909), told me that he had raised plants with a little flower eighteen months from seed, and plenty at thirty months. In *Proc. Roy. Soc. N.S.W.* li, 457 (1917), I reported that the species has flowered freely in the Sydney Botanic Gardens during the last four years, where a shrub of 3 feet 6 inches bore a profusion of palish pink flowers, somewhat concealed by the leaves. It is a decided acquisition to horticulture. This particular shrub is now (January, 1919) 8 feet high, with a spread of about 4 feet.

RANGE.

An exclusively Western Australian species described from near Coolgardie. (See fuller notes, this work, Part IV, p. 109.) It does not occur within the township of Coolgardie, and it seems desirable to give the following more specific localities—Widgemooltha (Diels and Pritzel), Norseman (W. D. Campbell), through Dr. A. Morrison.

Bulla Bulling (F. Stoward). (See also my note in *Journ. W.A. Nat. Hist. Soc.* iii, Jan., 1911.) The new locality is about 20 miles west of Coolgardie. (Maiden in *Proc. Roy. Soc. N.S.W.* li, 457, 1917.)

AFFINITIES.

1. With *E. incrassata* Labill.

This refers more particularly to the var. *angulosa* of that species, *E. torquata* and the variety displaying affinity in anthers and ribbing of buds and fruits.

2. With *E. Clelandi* Maiden, and

3. With *E. corrugata* Luehmann.

The affinity with *E. torquata* is less close. Compare Plate 69 for the former, and Plate 70 for the latter.

IX. *E. amygdalina* Labill.

THIS species has already been dealt with in Part VI of the present work, but as *E. radiata* Sieb., *E. numerosa* Maiden, and *E. nitida* Hook. f. have been carved out of it as there presented, it is desirable to recapitulate what I now recognise as *E. amygdalina*, confined, so far as we know, to Tasmania, as suggested by Messrs. Baker and Smith.

Labillardière's brief Latin description will be found on page 150, Part VI, of the present work.

Mr. L. Rodway, in *Proc. Roy. Soc. Tas.*, p. 12 (1917), has described it as follows:—

Black Peppermint. Usually a small tree, but often remaining only of the dimensions of a shrub. Slow growing, and on good land readily smothered by more robust competitors. The leaves are long, narrow, straight, or slightly unequal-sided, usually under one centimetre in diameter; substance thick, surface often shining, veins few and not widely diverging. Flowers about seven to nine in the umbel, clavate in bud, with a very short, nearly flat operculum. The fruit is almost hemispheric, tapering at the base into a short stalk; the orifice is usually flat or convex, not at all or but slightly constricted, valves not protruding, rim broad, 4 to 6 millimetres diameter. The bark is fibrous and persistent in the typical tree, but is very variable, leaving no clear line of demarcation between Black and White Peppermints (*E. linearis*).

The juvenile leaves of Black Peppermint are opposite, sessile, linear, and more or less rough, with glands. The timber of all the Peppermints is very durable.

It is very interesting to us dwellers on the mainland to learn this about the durability of the timber of the Peppermints. It is an illustration of the fact that we have yet to work out the optima of certain timbers which have extensive range.

SYNONYMS.

The following synonyms quoted in Part VI, page 150, referring to plants of Tasmanian origin, probably refer to *E. amygdalina*. We require evidence before referring others.

1. *E. salicifolia* Cav.
 2. *E. angustifolia* R.Br.
 3. *E. gracilis* Miq., non F.v.M.
 4. *E. tenuiramis* Miq.
-

RANGE.

So far as we know at present, this species is confined to Tasmania. It is very widely diffused in that island.

AFFINITIES.

1. With *E. linearis* Dehnh.

This is a close relation, at all events as far as herbarium specimens are concerned, but in the field they can usually be sharply separated, since *E. linearis* is exclusively, or almost exclusively, a smooth-barked tree, while *E. amygdalina* has a rough butt. The leaves of *E. linearis* are strikingly linear and graceful; those of *E. amygdalina* are broader and less light and graceful. Both are confined to Tasmania.

2. With *E. radiata* Sieber.

Of the three species, *E. amygdalina*, *radiata* and *numerosa*, *E. radiata* is the bulkiest species, with the broadest head, and with the trunk of greatest diameter. The foliage in the mass gives the species a dark or blackish appearance, which is enhanced with the greater proportion of rough, blackish bark, greater even than appears to be the case in *E. amygdalina*, which in Tasmania is hence known as "Black Peppermint." All three species exhale the perfume of Eucalyptus oil, particularly in misty weather.

The hemispherical operculum in *E. amygdalina* is marked.

3. With *E. numerosa* Maiden.

Amongst the three species, *E. amygdalina*, *radiata* and *numerosa*, *E. numerosa* stands out as a small to tall tree, a comparatively slender, graceful species, with long, smooth tops, from which hang long, tough ribbons, which earn for it the name of "Ribbon Gum." The branches are markedly pendulous, and the foliage in the mass is lighter and the individual leaves narrower. The flowers are so abundant, replaced subsequently by dense heads of fruits, as to be recorded in the specific name.

The ribbony bark is the toughest of all three species, but the relative characters of the three timbers require to be worked out.

DESCRIPTION.

CCI. E. radiata Sieber.

In De Candolle's *Prod.* iii, 218 (1828).

For notes on the species, see Part VI, page 152, of the present work.

The following description is based upon Bentham (B.Fl. iii, 202), but by no means literally follows that work :—

A tree, usually small or moderate-sized, but sometimes attaining a considerable height; the bark fibrous and persistent, not so fibrous as that of a "Stringybark," and of looser texture than that of a "Box,"—of the character usually known in Australia as "Peppermint," since it was originally observed on trees at Port Jackson whose foliage emitted a peppermint odour when crushed. The fibrous bark occurs only on the trunk, or, at most, on the largest branches. The branches are usually quite smooth or ribbony.

Juvenile foliage.—Opposite, narrow-lanceolate. Probably all forms have the twigs more or less rusty glandular; sometimes the leaves are in threes. (See fig. 3, Pl. 29.) The under side is often purple.

Mature foliage.—From linear to broadly lanceolate, straight or falcate, mostly acuminate, and 2 to 4 inches long; when narrow, rather thin; when broad, thicker; the veins few and oblique, but often inconspicuous, the intramarginal one at a distance from the edge, or rarely near to it. This species varies in the size, shape, and texture of the leaves. The usual shape in New South Wales is lanceolate, or even broadly lanceolate, but the typical form is linear-lanceolate, or even linear, comparatively thick, and the veins very oblique at the base, not prominent. Sometimes the foliage is quite dense, in other cases it is sparse. The various forms have leaves which have a pleasing, yet strong (sometimes very strong), odour of peppermint, to which circumstance they owe their commonest vernacular name.

Buds clavate, often glandular and rough.

Calyx-tube turbinate, about 2 lines diameter, tapering into a pedicel often as long as itself.

Operculum hemispherical, shorter than the calyx-tube; very obtuse, or slightly umbonate.

Peduncles axillary or lateral, terete or nearly so, with four to eight, and even more, flowers.

Flowers.—Stamens under 2 lines long, inflected in the bud, all perfect; anthers small, with diverging, more or less confluent cells. Ovary flat-topped.

Fruit.—Subglobose-truncate, usually under 3 lines diameter, but larger in some varieties; slightly contracted at the orifice, the rim flat or slightly concave and rather broad; the capsule not at all, or only slightly sunk, the valves flat or slightly protruding.

Figures.—It does not seem necessary to figure *E. radiata* Sieb. again, since it has been already figured in Plates 29 and 30, Part VI of the present work. There is a reproduction of De Candolle's drawing of Sieber's type at fig. 2, Plate 30, while fig. 6 of Plâté 29 is an original drawing of a portion of the co-type. Still considering Plate 29, figures 4, 5, 7, 8 and 9 are all referable to *E. radiata*.

In addition, a whole plate drawing of the species will be found at Plate 62, Part xvi of my "Forest Flora of New South Wales." It is also figured as *E. amygdalina* (*typica*) by Deane and Maiden in *Proc. Linn. Soc. N.S.W.* xx, Plate LV.

SYNONYMS.

1. *E. amygdalina* Labill., var. *radiata* Benth.

At Part VI, page 152 of the present work, is an annotated list of synonyms believed to belong to *E. amygdalina*. Those that we know to belong to plants of Tasmanian origin are doubtless *E. amygdalina*; others may or may not be synonyms of *E. radiata* Sieb., and this can only be solved by comparison, if desired, with the original material (often only seedlings).

2. *E. australiana* Baker and Smith, *Journ. Roy. Soc. N.S.W.* xlix, 514 (1915).
See my comments in the same *Journ.* li, 461 (1917).

RANGE.

It occurs in Eastern Australia, including both Victoria and New South Wales, being found at no very great distance from the coast until 100 miles south of Sydney is reached. It gradually ascends both the southern and northern tablelands, becoming common in New England, increasing in distance from the coast. It is hard to believe that it will not be found about Stanthorpe or in other Queensland localities on the Macpherson Range.

The Victorian and New South Wales localities given under *E. amygdalina* in Part VI, pages 160, 161 of the present work, refer to *E. radiata*. I have a brief note of the range of *E. radiata* in *Journ. Roy. Soc. N.S.W.* li, 463 (1917). It will be convenient to have the following localities, as represented in the National Herbarium of New South Wales :—

VICTORIA.

Lilydale, with filiform pedicels (A. W. Howitt). Upper Yarra, fruits small (J. Staer). Mount Macedon (W. S. Brownscombe, R. H. Cambage). "Narrow-leaved Peppermint." About 50 feet. Daylesford (J. Blackburne, No. 20).

Following are rising Gippsland localities :—

Boggy Creek, Buchan-road, with broadish leaves (J.H.M.). Stony Creek, Dargo (A.W. Howitt). "Peppermint," near the Big River on the new road between Omeo and Glen Wills. Up to 3 or 3½ feet in diameter. (H. Hopkins, 2/12). Bulgaback, North Gippsland (A. W. Howitt).

"Peppermint." Tynong, near Pakenham (E. Cheel). "Peppermint." Darlimurla, S. Gippsland (H. Deane). Genoa (H. Hopkins).

NEW SOUTH WALES.

The following join on with the high Victorian localities :—

"Messmate," Tumut (Forest Ranger Mechem). Gilmore, near Tumut, rim thicker (J. L. Boorman). Batlow (A. W. Howitt). "Messmate," Batlow (W. H. Austin). Sent to me as typical of *E. australiana*. "Messmate," Bago Forest Reserve, Batlow district (W. A. W. de Beuzeville). "Peppermint," 20–40 feet. Fairly plentiful, more particularly on road to Batlow. Tumbarumba (J. L. Boorman). "Peppermint." Large trees on granite and basalt. Laurel Hill, Tumbarumba (R. H. Cambage, No. 871). Talbingo (A. W. Howitt). "Peppermint." Cockatoo, near Holbrook (W. Forsyth). Yarrangobilly (A. W. Howitt). "Messmate," Yarrangobilly Saw-mills (W. W. Gillespie, E. Betcher). "Messmate," Snowy River, near head of Murray (E. M. de Burgh).

Following are nearer the South Coast :—

Bellimbella, near Nerrigundah, also township of Nerrigundah (E. Cheel). "Tall ribbon-barked tree of 60–80 feet." Nerrigundah (J. L. Boorman). Tree of 2 feet diameter. Used for oil distillation. Dignam's Creek, between Cobargo and Tilba Tilba (J. L. Boorman). In sending specimens from Yourie, near Cobargo, and Reedy Creek, near Nerrigundah, Mr. Boorman says they are similar in every respect to Dignam's Creek. "Used for oil." Yourie (W. Dunn, No. 23). "Rich in oil, diameter 8–15 inches; 25–30 feet." Yourie River (O. Smith). "Messmate or Peppermint." Mount Stromlo, Federal Territory, with filiform pedicels (C. T. Weston, No. 4). Burrinjuck (J. L. Boorman).

Wyndham and Big Jack Mountain (J. L. Boorman, E. Cheel). Wyndham (A. W. Howitt, E. Cheel). Mr. Cheel's specimens are juvenile leaves from trees cut down by oil-distillers.

Braidwood, with filiform pedicels (E. Cheel). Corang River, Braidwood (E. Cheel). "Peppermint," Reedsdale, near Braidwood (H. Deane). Durran Durra, near Braidwood, juvenile leaves only (E. Cheel). Buddawang, fruit only (E. Cheel). Little River, Braidwood (J. S. Allan). Araluen to Braidwood (J.H.M.). Locally distilled for oil, Marulan (Mr. Simmonds, August, 1892). Nye's Hill, Wingello, and Wingello, with filiform pedicels (J. L. Boorman). Penrose (S. H. Pearce). Mittagong (Rev. Dr. Woolls). Berrima (J. L. Boorman). Kangaloon (J. L. Bruce). "Narrow-leaved Peppermint," Goulburn (H. Deane). Hill Top (J.H.M.).

Following are Western (Blue Mountains) localities :—

In valley below the pool, 1 mile west of Woodford (R. H. Cambage, No. 4004). Wentworth Falls (R. H. Cambage, J.H.M.). Blackheath (J.H.M.). Variable within limits as all fruits are. An independent observer notes "These fruits cannot be separated from *E. australiana*." Juvenile leaves vary to broadish; Mount Victoria (J.H.M.). Some of these fruits have the valves slightly exsert. Most of them and the twigs generally are such a match of the *E. radiata* type than I am quite unable to point out any difference between them.

From a tree near the cricket ground, Jenolan Caves, about 20 feet high (W. F. Blakely). With a more defined broader rim than typical *radiata*, but still that species in my opinion. (This was referred to as approaching *E. nitida*, in Part VI, p. 163.)

Mount Wilson (J.H.M.). Some of the leaves coriaceous, and some of the fruits shining, making them somewhat reminiscent of *E. nitida* Hook. f.

Mount Tomah (Jesse Gregson).

Mount Blaxland to Rydal (R. H. Cabbage and J.H.M.).

Mullion Creek, near Orange, the most westerly locality recorded so far (R. H. Cabbage).

Following are some Northern localities :—

“Messmate.” Tree of 70 feet, 7 feet girth. Parish Yeerowin, County Parry (E. H. F. Swain). “Messmate” or “Almond-leaved Stringybark,” 150 feet, with barrel of 40 feet, girth 8 feet. Parish Nundle, County Parry (M. H. Simon). Like Messmate, 18 inches diameter, height 40 feet. Hanging Rock, *viâ* Nundle (E. Julius, J. L. Boorman, J.H.M.).

Moona Plains, Walcha (A. R. Crawford).

Yarrowitch to Tia (J.H.M.).

“Messmate,” Tyringham to Bald Hills (Grafton-Armidale road) (J.H.M.). “Bark rough but not stringy, of moderate girth.” Marengo, near Guy Fawkes (J. F. Campbell).

“9 feet in girth, with a barrel of about 18 feet.” Oban, County Clarke (Forest Guard S. G. Ruddock).

“Messmate,” Bald Nob, Glen Innes district (J. L. Boorman).

Wilson’s Downfall (J. L. Boorman).

AFFINITIES.

1. With *E. amygdalina* Labill.

2. With *E. numerosa* Maiden.

Discussed at page 228.

CCII. *E. numerosa* Maiden.

Proc. Linn. Soc. N.S.W. xxix, 752 (1904).

THE synonymy is as follows. It has been so fully described and illustrated at the places cited, that there should be no difficulty whatever now in recognising the species.

E. amygdalina Lab. var. *radiata* Benth. (B.Fl. iii, 203) in part, but not *E. radiata* Sieb.

See also Deane and Maiden, *Proc. Linn. Soc. N.S.W.* xx, p. 603, with Plate LVI (1895).

E. numerosa Maiden in Part xvii, p. 146, of my "Forest Flora of N.S.W.," with Plate 66 (1905).

E. amygdalina Labill. var. *numerosa* Maiden, "Crit. Rev." VI, 155, with fig. 1, Plate 30 (1905).

I did wrong in temporarily suppressing *E. numerosa*; it is a distinct species. This step originally arose through accepting the view of Bentham (B.Fl. iii, 203) that *E. radiata* included the plant which we now know as *E. numerosa*.

RANGE.

See Part VI, pp. 161-2, of the present work. It has not since been found out of Victoria and New South Wales. The following localities are additional to those previously quoted.

VICTORIA.

Foot of Mount Macedon (E. Cheel). Gisborne (J. Staer). Kilmore (Rev. J. W. Dwyer, No. 1023). Boggy Creek, Buchan-road (J.H.M.).

"Rough bark on base of bole to 12-20 feet up, then clean, smooth bark, with thin ribbons of old bark hanging to branches. Graceful pendulous branchlets and foliage. Not a very large tree. Mostly small trees. Leaves of saplings also very narrow, and on young saplings narrow, opposite and sessile. Locally known as 'Peppermint Gum.' Owing to its weeping habit of growth it rather resembles the Blackbutt of E. Gippsland (*E. pilularis*)." Genoa township (H. Hopkins).

"Slender somewhat pendulous branchlets and very narrow leaves, on both saplings and old trees. Bark on lower part of bole scaly-rough, and upper part of stem and branches quite smooth, with old bark peeling off in thin ribbony flakes. Wood full of gum, soft and inferior." In the rich bottom ground along the Cann River (H. Hopkins).

NEW SOUTH WALES.

Southern localities.—"Peppermint," sometimes called "Messmate." Laurel Hill, Tumberumba (W. Kopsen). "Narrow-leaved Messmate." Attains a height of

over 100 feet and exceeds 4 feet in diameter. Is considered a fine timber and is largely used for fencing purposes. It is almost solely used at Kopsen's factory for pick-handles. It would make fine furniture, as it takes a good polish and looks exceedingly well when worked into chairs and tables. Found throughout the mountainous parts of the district. Grows equally well along sides of gullies and tops and sides of hills. Tumberumba (H. A. Timms).

Big Jack Mountain, near Wyndham, at 3,000 feet (E. Cheel). Greig's Flat, near Pambula (E. Cheel).

Yourie, County of Dampier (Forest Guard Oliver Smith).

"Tall tree, thin stem: stems of a ribbony nature, the ribbons hanging often many feet in length, which, through the inner bark being of a whitish colour, give the plant the name of White Top. The bark of the lower part of the stem is persistent, and being often blackened, gives the plant a black butt, which contrasts with the white tips." Yourie, near Cobargo (J. L. Boorman).

Bermagui (Forest Guard W. Dunn). Murrah River (W. Dunn).

"Peppermint," Boyne State Forest, 4 miles north of Bateman's Bay (L. Walker). Called "Ribbon Gum," Boyne, 10 miles north of Bateman's Bay (L. Walker).

Burrinjuck (J. L. Boorman).

Drooping. Heavy crop of fruit. Common in the district. Condor Creek at foot of Mount Coree, Brindabella-Uriara road, Canberra (C. Weston).

Bell's Paddock, Arahuen (R. H. Cambage). Durran Durra, near Braidwood (E. Cheel).

Bundanoon (W. Greenwood, No. 163). Small Weeping-willow like tree, smooth bark. Bowral (W. Greenwood, No. 177). Mittagong (W. Dunn). Berrima (J. L. Boorman).

Foot of Mount Jellore (E. Cheel).

Hill Top, near Saw-mills (E. Cheel).

Kangaroo Valley (J.H.M.).

Menangle (A. A. Hamilton). Cobbitty, banks of Nepean (J.H.M.). Odour impregnates the surrounding air. Bent's Basin, Nepean River (E. Cheel and J. L. Boorman). Glenbrook Creek, Nepean River (J.H.M.).

"Very tall tree, with comparatively thin stem, 2-3 feet diameter, usually much less. Bark of Peppermint nature. Timber straight in grain. Not plentiful." Glengowan, Upper Meroo (J. L. Boorman and A. Murphy). This and Putty, near Singleton (Part VI, p. 162), are the most northerly localities recorded so far.

AFFINITIES.

1. With *E. radiata* Sieber.
2. With *E. amgydalina* Labill.

Discussed at page 228.

DESCRIPTION.

CCIII. E. nitida Hook. f.

In *Fl. Tas.* i, 137, with tab. xxix (1860).

THE brief original Latin translation is quoted at Part VI, p. 158 of the present work, and following is a translation :—

A fairly tall tree with hanging branchlets, leaves narrow-lanceolate, long-acuminate, coriaceous, shining, with varnished diverging veins. Peduncles strong, many-flowered. Flowers short, somewhat sessile, calyx shortly clavate or obconical, operculum short and broad, fruits sessile, small, somewhat globose, the mouth contracted or somewhat dilated, the margins thick or narrowly flat.

(Gunn's 808 is quoted as the type, and some specimens of this number are quoted at Part VI, p. 163 of the present work.)

Following is a description of the juvenile leaf shoots taken from my paper in *Proc. Roy. Soc. Tas.*, p. 84, 1918.

Opposite or slightly alternate, sessile, orbicular, ovate to elliptical lanceolate, interspersed with spreading veins on both sides, somewhat rough, branchlets angular or compressed, red-brown, tuberculate, with prominent oil-glands, internodes distinctly dilated at the base of the leaves, caused by the fusion of the petioles.

Figures.—In addition to the excellent plate of the type already quoted, fig. 2, Plate XII, illustrating my paper in *Proc. Roy. Soc. Tas.*, 1918, which depicts the broad juvenile foliage, may be referred to.

SYNONYM.

E. amygdalina Labill. var. *nitida* Benth. (B.Fl. iii, 203).

RANGE.

It is confined to Tasmania and New South Wales, so far as we know at present, but one would expect to find it either in south coastal localities in Victoria, or in sub-alpine areas in that State.

TASMANIA.

So far as we know at present, it is confined to the northern and western parts of the island.

See pages 158 and 163 (Part VI) for particulars as to some Tasmanian localities. In addition, see Maiden and Cabbage in *Proc. Roy. Soc. N.S.W.* xlviii, 416 (1914).

Ten to fifteen feet high. Towards summit of Mount Bischoff, Waratah, County Russell, West Tasmania (R. H. Cabbage, 4103).

Small stunted trees near summit of Mount Roland (3,700 feet), near Sheffield, County Devon (R. H. Cabbage, Nos. 4097 and 4099).

Mr. L. C. Irby also collected this species near Devonport, as quoted in my Tasmanian 1918 paper, page 84.

NEW SOUTH WALES.

Mallee-like, 6-8 feet high. Kydra Trigonometrical Station, Kybean (4,030 feet) north-east by east of Nimitybelle (R. H. Cabbage, No. 2004). This locality is in the southern Monaro.

Mr. Cabbage and I (*Proc. Roy. Soc. N.S.W.* xxx, 192, 1905) record the species also from Mount Victoria and Blackheath, in the Blue Mountains, but these plants are not perfectly typical.

AFFINITIES.

1. With *E. amygdalina* Labill.

Bentham (B.Fl. iii, 203), comparing it with *E. amygdalina*, says, "Leaves broader and more rigid. Peduncles and pedicels shorter. Flowers rather longer."

From the three allied species, *E. amygdalina*, *E. radiata*, and *E. numerosa*, it is sharply separated by its broad juvenile foliage. Of these three it is closest allied to *E. amygdalina*, but it is usually a smaller plant, and Bentham has already stated some of the differences.

Explanation of Plates (156-159).

PLATE 156.

E. tessellaris F.v.M.

1. Juvenile leaves, rather broad. Just north of Rockhampton, Queensland. (Andrew Murphy.)
2. Mature leaves, rather short. 40 or 50 miles north-west of Collarenebri, N.S.W. (Sid. W. Jackson.)
- 3a. Inflorescence and leaf; 3b, back and front view of anther; 3c, fruits. Reid River, near Townsville, Queensland. (N. Daley.)

E. Spenceana Maiden.

- 4a. Broad juvenile leaf; 4b, broad mature leaf with buds; 4c, anthers. Stapleton, Northern Territory. (G. F. Mill, No. 457.)

PLATE 157.

E. Spenceriana Maiden.

1. Mature leaf and buds with pointed opercula. Stapleton, Northern Territory. (G. F. Hill, No. 456.)
- 2a. Juvenile leaf; 2b, mature leaf; 2c, fruits; 2d, section of fruit showing thinness of rim, and the sunken capsule. "Common Box Gum," Burrundie, Northern Territory. (Dr. H. I. Jensen, No. 346.)
- 3a. Mature leaf; 3b, fruits. "Black Box," rare. Edith River, near Roper River, Northern Territory. (W. Scott Campbell.)

E. Cliftoniana W. V. Fitzgerald.

- 4a. Mature leaf; 4b, fruits. Mount Anderson, near Grant Range, North-west Australia. (W. V. Fitzgerald, p. 209.) The type.

E. setosa Schauer.

5. Portion of twig, being the type in the Vienna Herbarium, with a label in Schauer's handwriting: "Eucalyptus setosa Schauer, in Walp. Repert."
- 6a. Lower leaves; 6b, upper leaves and inflorescence; 6c, front and back views of anther. Normanton. Gulf of Carpentaria, North Queensland. (Ivie Murchie, No. 5.)
7. Fruits. Normanton. R. H. Cambage (No. 3933.)

PLATE 158.

E. setosa Schauer.

- 1a. Inflorescence (young buds). Note the bracts and bracteoles which are early deciduous in Eucalyptus; 1b, urceolate unripe fruit; 1c, mature fruits plentifully covered with hairs, and exhibiting irregular cracking of the surface, 1d, mature fruit.
2. Mature fruit. Croydon, North Queensland. (James Gill.)
3. Juvenile leaves. Stapleton, Northern Territory. (G. F. Hill.)
- 4a. Bud, with pointed operculum, destitute of hairs, both characters due to shrivelling; 4b, expanded flower, showing bract. Brook's Creek, Northern Territory. (C. E. F. Allen's No. 304.)
- 5a. Young juvenile leaf, venation well marked, and hairy all over; 5b, ripe fruit urceolate and hairy. Woolgni, Northern Territory. (Dr. H. I. Jensen.)
6. Leaves and fruits. Pine Creek Railway, Northern Territory. (E. J. Dunn.)
- 7a. Broadly lanceolate thick, mature leaf; 7b, large, almost smooth fruit. Tanami, Northern Territory. (C. E. F. Allen's No. 204.)
- 8a. Juvenile leaf; 8b and 8c, mature leaves in various stages; 8d, 8e, different views of a sessile, fully mature fruit. Broome, W.A. (W. V. Fitzgerald, No. 123.)

PLATE 159.

E. ferruginea Schauer.

1. Leaves, buds and flowers. Both sides of the leaves are covered with a stellate tomentum. Drawn from portion of the type of *E. ferruginea* in the Vienna Herbarium, and bearing the following inscription in Schauer's handwriting: "*Eucalyptus ferruginea* Schauer in Walp. Repert."
- 2a. Opposite mature leaf, with short petiole; 2b, buds. (Robert Brown, Iter Australiense, 1802-5.)
- 3a. Leaf and inflorescence; 3b, front and back sides of anther. (Robert Brown, I. (Isles) of Carpentaria, 1802-5. No. 4781 of J. J. Bennett's British Museum distribution of 1876. Probably from the same collecting as 2a.)
- 4a. Mature leaf, sessile. The entire surface, back and front, is covered in a close, stellate tomentum; 4b, fruits, which alone of the specimens are smooth. A medium-sized tree at Glencoe Station. Arnhem's Land, Northern Territory. (N. Holtze.)

The following species of *Eucalyptus* are illustrated in my "Forest Flora of New South Wales"* with larger twigs than is possible in the present work; photographs of the trees are also introduced wherever possible. Details in regard to their economic value, &c., are given at length in that work, which is a popular one. The number of the Part of the Forest Flora is given in brackets :—

<i>acacioides</i> A. Cunn. (xlviii).	<i>melanophloia</i> F.v.M. (liv).
<i>acmenioides</i> Schauer (xxxii).	<i>melliodora</i> A. Cunn. (ix).
<i>affinis</i> Deane and Maiden (lvi).	<i>microcorys</i> F.v.M. (xxxviii).
<i>amygdalina</i> Labill. (xvi).	<i>microtheca</i> F.v.M. (lii).
<i>Andrewsi</i> Maiden (xxi).	<i>numerosa</i> Maiden (xvii).
<i>Baileyana</i> F.v.M. (xxxv).	<i>obliqua</i> L'Hérit. (xxii).
<i>Baueriana</i> Schauer (lvii).	<i>ochrophloia</i> F.v.M. (l).
<i>Baueriana</i> Schauer var. <i>conica</i> Maiden (lviii).	<i>odorata</i> Behr and Schlechtendal (xli).
<i>Behriana</i> F.v.M. (xli).	<i>oleosa</i> F.v.M. (lx).
<i>bicolor</i> A. Cunn. (xliv).	<i>paniculata</i> Sm. (viii).
<i>Boormanii</i> Deane and Maiden (xlv).	<i>pilularis</i> Sm. (xxxi).
<i>Bosistoana</i> F.v.M. (xliii).	<i>piperita</i> Sm. (xxxiii).
<i>Caleyi</i> Maiden (lv).	<i>Planchoniana</i> F.v.M. (xxiv).
<i>capitellata</i> Sm. (xxviii).	<i>polyanthemos</i> Schauer (lix).
<i>Consideniana</i> Maiden (xxxvi).	<i>populifolia</i> Hook. (xlvii).
<i>coriacea</i> A. Cunn. (xv).	<i>propinqua</i> Deane and Maiden (lxi).
<i>corymbosa</i> Sm. (xii).	<i>punctata</i> DC. (x).
<i>crebra</i> F.v.M. (liii).	<i>regnans</i> F.v.M. (xviii).
<i>dives</i> Schauer (xix).	<i>resinifera</i> Sm. (iii).
<i>fruticetorum</i> F.v.M. (xlii).	<i>rostrata</i> Schlecht. (lxii).
<i>gigantea</i> Hook. f. (li).	<i>saligna</i> Sm. (iv).
<i>goniocalyx</i> F.v.M. (v).	<i>siderophloia</i> Benth. (xxxix).
<i>hæmastoma</i> Sm. (xxxvii).	<i>sideroxyylon</i> A. Cunn. (xiii).
<i>hemiphloia</i> F.v.M. (vi).	<i>Sieberiana</i> F.v.M. (xxxiv).
<i>longifolia</i> Link and Otto (ii).	<i>stellulata</i> Sieb. (xiv).
<i>Luehmanniana</i> F.v.M. (xxvi).	<i>tereticornis</i> Sm. (xi).
<i>macrorrhyncha</i> F.v.M. (xxvii).	<i>virgata</i> Sieb. (xxv).
<i>maculata</i> Hook. (vii).	<i>vitrea</i> R. T. Baker (xxiii).

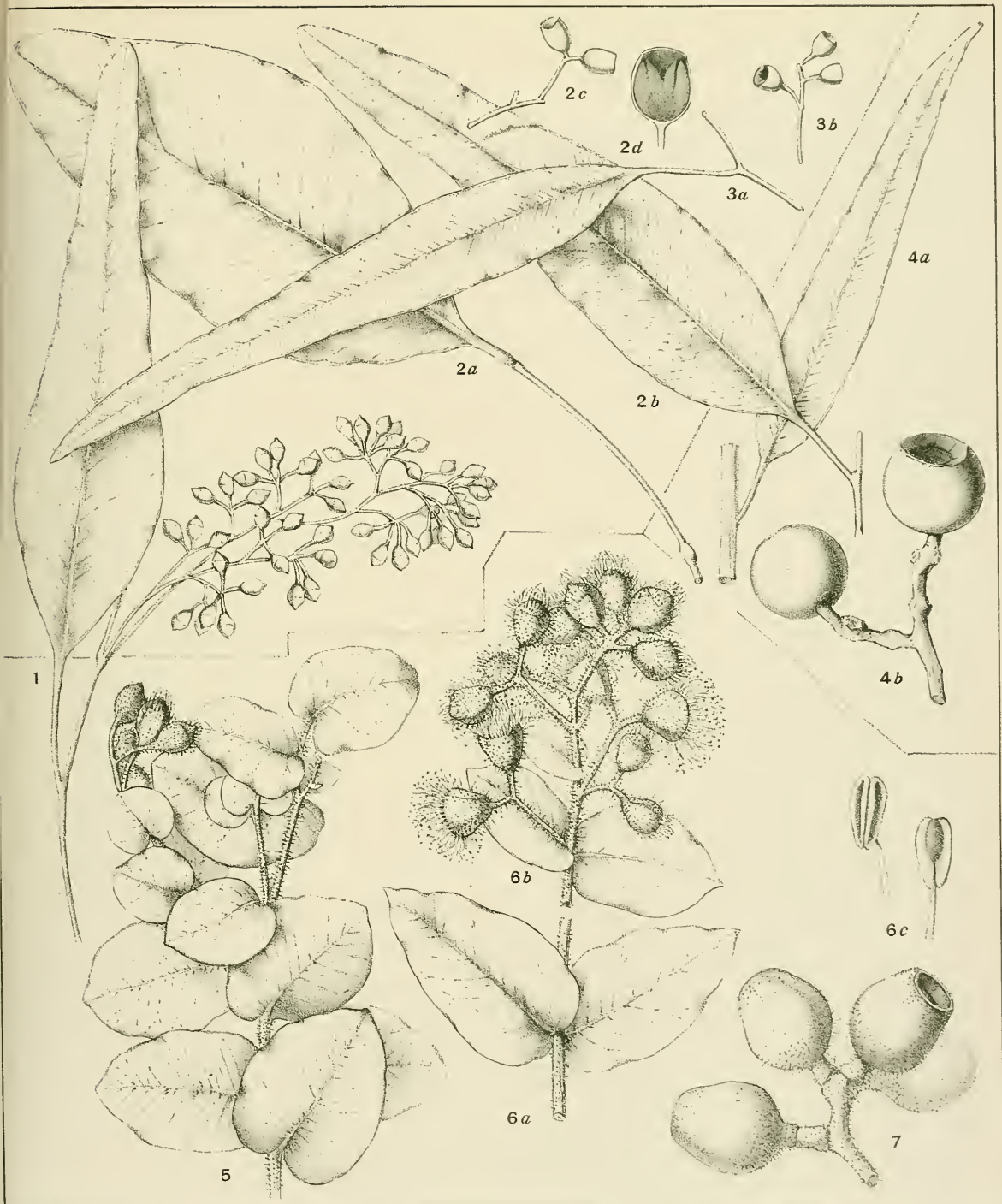
* Government Printer, Sydney. 4to. Price 1s. per part (10s. per 12 parts); each part containing 4 plates and other illustrations.



M. Flockton del. et lith.

EUCALYPTUS TESSELLARIS F.v. M. (1-3)

E. SPENCERIANA MAIDEN. (4) [See also Plate 157.]



EUCALYPTUS SPENCERIANA MAIDEN. (1-3) [See also Plate 156.]

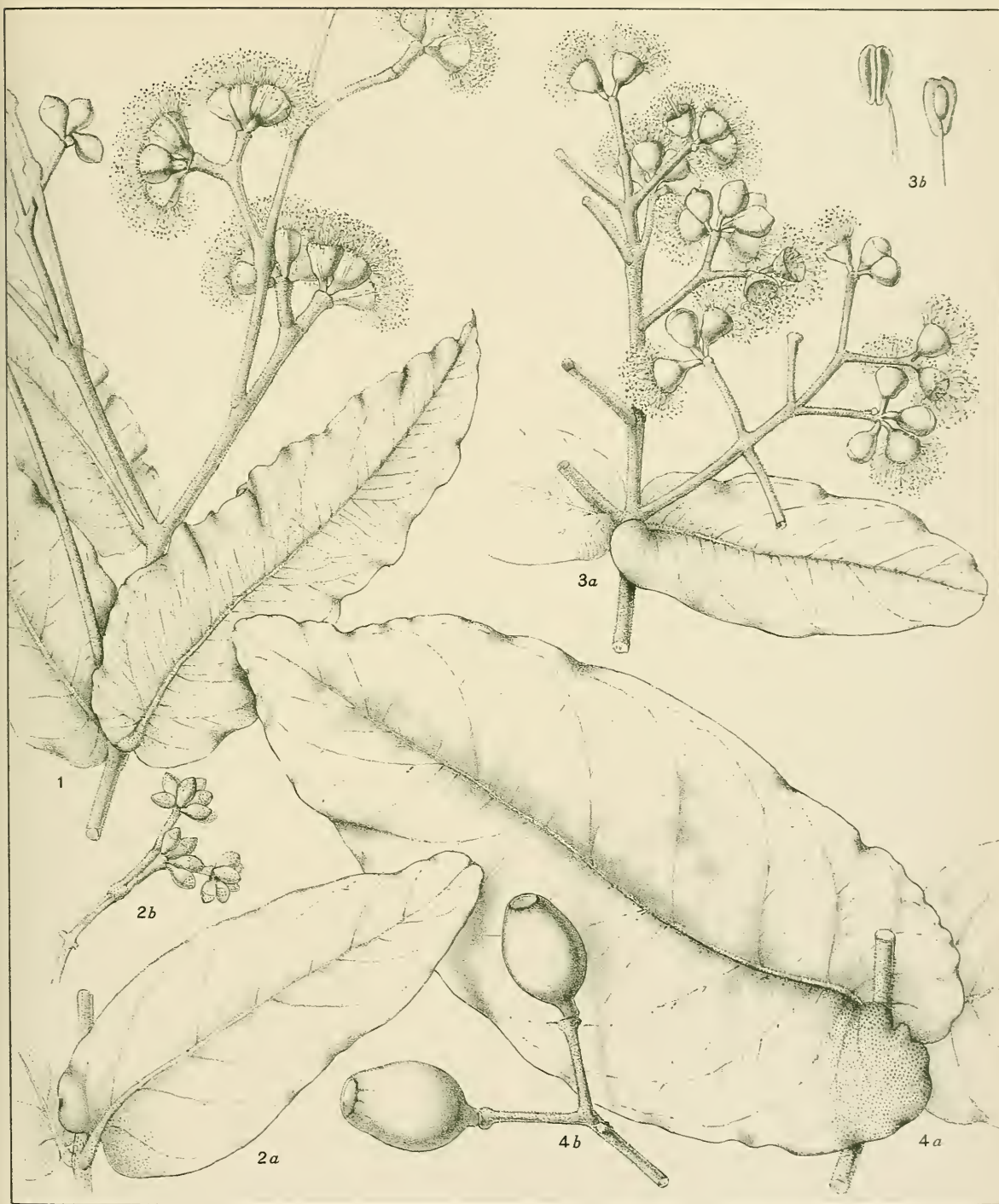
E. CLIFTONIANA W. V. FITZGERALD. (4)

E. SETOSA SCHAUER. (5-7) [See also Plate 158.]



M. Floeckner del. et lith.

EUCALYPTUS SETOSA SCHAUER. [See also Plate 157.]



H. Fleckton del. et lith.

EUCALYPTUS FERRUGINEA SCHAUER.

DESCRIPTION.

CCIV. *E. Torelliana* F.v.M

In *Fragmenta* x, 106 (1877).

FOLLOWING is a translation of the original:—

A tall tree, with terete branchlets and petioles hispid-scabrous, *leaves* broad, or cordate-ovate, scattered or here and there opposite, deep green on the upper side, somewhat distantly pinninerved, scantily hispid, the peripheral vein distant from the margin, *terminal panicles* many-flowered, glabrous, the ultimate *peduncles* strong, angular, and mostly rather long, *pedicels* very short, the *tube of the exangular calyx* campanulate-semi-ovate, twice as long as the depressed hemispherical and hardly apiculate operculum, *stamens* bent in before expansion, anthers oblong with parallel cells dehiscing along their whole length, *stigma* barely dilated, *ovary* 3-celled.

Near Trinity Bay: Fitzalan.

Branchlets fairly strong, covered with a darkish indument. *Petioles* about $1\frac{1}{2}$ inches long or a little longer. *Leaves* rather papery than coriaceous, 2-3 inches long, $1\frac{1}{2}$ -2 inches broad, on the under side rather pale-green, but not, however, becoming paler, on neither side very shiny, not acuminate, but plentifully dotted with pellucid oil-bearing glands, conspicuously hispid as far as the nerves, and traversed by veins and veinlets. *Panicles* with spreading branches; the ultimate peduncles crowded, rarely exceeding $1\frac{1}{2}$ inches at the point of expansion and often shorter. The *calyx tube* about 3 lines long; *operculum* shining, smooth, hardly more than 2 lines broad. I have no opened flowers. *Anthems* below the apex, at the back thickened with a gland. *Fruits* unknown.

I have given to the species the name of Count L. de Torelli, a member of the Italian Senate, who, under royal patronage, established a plantation of Eucalypts in the Pontine marshes, in order (to endeavour) to suppress malaria.

[Count Torelli was author of a small work "L'Eucalyptus e Roma"] (Rome, 1879).

Mueller did not describe the mature leaves, although he thought he had done so; what he described were the juvenile leaves (see figs. 2a, 2b, 3a of Plate 160). The mature leaves are shown at 2c and 2d of the same Plate, and may be described as petiolate, lanceolate, acuminate, say 10-15 cm. long, with a maximum width of 2 cm.; venation tending to be pinnate.

The fruits, which were unknown to Mueller, are spheroid-urceolate, high shouldered, with a marked rim; contracted at the orifice, about 7 mm. in diameter. The species was not figured in "Eucalyptographia."

"Branches spreading. Young leaves round and hispid, older leaves narrow and elongated. All young trees up to 20-30 feet in height carry the rounded hispid leaf in early leaf-growth; these become narrow and elongated."

The following notes on the bark and timber are also compiled from letters from Mr. H. W. Mocatta, District Forester, Atherton :—

The Cadagi tree is very like Moreton Bay Ash (*E. tessellaris*). Bark black and scaly up to about 10 feet from the ground, thence upwards dark green and glossy. The lower part of the bark is in *thin tesserae*. The lower part of the trunk always carries the scaly bark up to 10 or 15 feet, the smooth glossy green bark reaches thence upwards.

Cadagi wood is esteemed a very useful timber, but is not extensively milled where it would have to be hauled long distances, as teamsters do not like it on account of its weight. It is considered an excellent wood for waggon-building; it is also a good lasting timber in the ground. The wood is very fissile, reminding one of Spotted Gum, only freer; it is very pale—whitish to pale brown. The tree grows to good marketable size.

RANGE.

So far as we know, this species is confined to northern Queensland. The type came from Trinity Bay.

“Blue Gum, the largest tree in the forest. The bark is pale blue, smooth as glass.” Sea View (?), Rockingham Bay (J. Dallachy).

Trees found mostly on scrub fringes, but also grow well into heart of scrubs. Habitat on coastal ranges from behind Ingham to Port Douglas, North Queensland. (H. W. Mocatta.)

AFFINITIES.

1. With *E. setosa* Schauer.

The species would be placed with *E. setosa* but for the sprinkling with colour and the size of the leaves, the twisting of the petioles, the fewness of the pedicels on the petiole and their shortness, the smoothness of the calyx and the shape of the operculum; it should be seriously compared as regards the bark, timber, fruit-bearing calyx and seeds. (Original description.)

Compare Plates 157, 158, Part XXXVII, with Plate 160 of the present Part. It will be seen that *E. setosa* is much more persistently homoblastic (juvenile) than *E. Torelliana*; the leaves are sessile in the former and petiolate in the latter. The buds are of a different shape, and very setose in *E. setosa*; in *E. Torelliana* the fruits are smaller, more urceolate than in *E. setosa*, and also glabrous and sessile. *E. Torelliana* is a shaft-like Gum, while *E. setosa* is a spreading, fibrous-barked tree.

2. With *E. aspera* F.v.M.

It differs from *E. aspera* in the distribution of the leaves, which are not glaucous and grow upon conspicuous petioles, in the flowers which are crowded on terminal panicles, and perhaps in the fruits. (Original description.)

Compare figs. 7, 8, Plate 152 (*E. aspera*), a species imperfectly known, even yet. It is a small tree with smooth bark; *E. Torelliana* is a tall, shaft-like tree. So far as we know, *E. aspera* remains in the homoblastic stage. The fruits of *E. aspera* are papery or *Angophora*-like; those of *E. Torelliana* are urceolate, and more akin to the *Corymbosæ*.

3. With *E. latifolia* R.Br.

Our new species differs from *E. latifolia* in the indument, leaves which are not glaucescent, smaller flowers, which are fewer on the peduncle. (Original description.)

Figures of *E. latifolia* are not yet published, and a fuller comparison will be given when that species is depicted. But it may be at once stated that the two species are very dissimilar; the leaves of *E. latifolia* are always broad, and the fruits scarcely urceolate, and with long, slender peduncles and pedicels.

4. With *E. peltata* F.v.M.

Perhaps *E. peltata* will require to be placed nearest to *E. Torelliana*, although the latter stands on record as one of the tallest forest trees near Rockingham Bay, with "a bark smooth as glass"; moreover the hairiness of its branchlets and leaf stalks is more conspicuous, all its leaves are of completely basal insertion and evidently paler beneath, therefore their stomata are not isogenous but heterogenous; the flowers and fruits may also prove different, the former being only as yet known in an unexpanded state, and the latter having never been yet collected at all. ("Eucalyptographis," under *E. peltata*.)

First we must compare the figures of *E. Torelliana* with those of *E. peltata*, which are not published yet. But it may be at once pointed out that the former is a tall shaft-like Gum of coastal areas, while the latter is a yellow-barked Bloodwood of inland regions of low rainfall. Both have peltate juvenile leaves, more or less besprinkled with hairs; *E. peltata* has opercule more pointed, longer in comparison with the calyx-tube, with fruits different in shape, and sometimes ovoid.

5. With *E. maculata* Hook.

But it seems that the closest affinity of *E. Torelliana* is with this species, or at all events these two species have considerable resemblance externally. Both are Gums, but *E. maculata* displays a greater tendency to branch than *E. Torelliana*, that is to say, it is less shaft-like. Its bark is practically smooth to the ground, while *E. Torelliana* has usually a good deal of rough bark, and is a denizen of rich soil and sheltered situations; *E. maculata* flourishes under hard conditions, like the Ironbarks. They have affinities in juvenile leaves, the buds may be a good deal similar, though those of *E. maculata* may be more pedicellate, but the fruits are very different; both are urceolate, but those of *E. Torelliana* are spheroidal, with a high shoulder, and sessile.

DESCRIPTION.

CCV. *E. corymbosa* Smith.

In "Botany of New Holland," Vol. I, p. 43 (1793). (This work is sometimes bound up with a zoological portion, and then becomes "Zoology and Botany of New Holland," by G. Shaw and J. E. Smith.)

Following is the original description:—

E. corymbosa, operculo hemisphaerico mucronulato, umbellis corymboso-paniculatis terminalibus.

Lid hemispherical, with a little point. Umbels panicled in a sort of terminal corymbus.

This, when in flower, is the most magnificent of its genus. The leaves are lanceolate, astringent and acrid, but scarcely at all aromatic. (N.B.—This is the first reference to the absence, or almost absence, of oil in *E. corymbosa*.—J.H.M.) Flower-stalks all compressed. Lid somewhat membranous.

He redescribes it in *Trans. Linn. Soc.* iii, 287 (1797), embodying the brief Latin description, and adds—

The flowers are large and handsome, forming magnificent terminal panicled clusters of umbels, by which this species is readily distinguished. Leaves lanceolate, coriaceous. Fruit turbinate, the permanent calyx forming a very high urceolate border, the style remaining in the centre of the cavity.

It is described in Latin with a figure (Tab. 340) in Cavanilles' *Icones*, Vol. iv, p. 23, which is so exceedingly rare that it will be convenient to have a copy of the original, which follows:—

Eucalyptus corymbosus. Tab. 340. (A portion of the figure is reproduced at Plate 161, fig. 4.)

372. *Eucalyptus foliis lanceolatis, petiolis, subulatis: floribus corymbosis*.

Caulis arboreus 20-30 pedes altus, ramis alternis, numerosis.

Folia alterna petiolata, petiolo leviter alato, lanceolata cum acumine producto, uninervia nervulis numerosissimis parallelis oblique ad primum positis, nitida et nonnihil coriacea.

Flores corymbosi terminales, corymbo ex pluribus umbellis 4 aut 5-floris.

Calix turbatus, integerrimus, coriaceus, truncatus, calyptra hemisphaerica decidua tectus, in duas concamerationes diaphragmate partitus, in quorum inferiore germen, in superiore stamina dum inflexa et clausa sunt calyptra.

Staminum filamenta fere 80, limbo calicis variis ordinibus inserta, interiora breviora, exteriora, semipollicem longa lutea; antherae reniformes nutantes.

Germen turbinatum; stylus calice longior; stigma obtusum.

Fructum non vidi, qui ex germine fecundato apparet capsula trilocularis.

Habitat in nova-Hollandia prope oppidum Jackson, floretque Aprili. Ex eodem herbario.

Explic. tab. a Calix calyptratus. *b* Idem calyptra dehiscente. *c* Idem staminibus erectis. *d* Idem sectus ut appareat diaphragma sub quo jacet germen. *e* Filamentum auctum. *f* Germinis aucti sectio transversalis. (Cavanilles *Icones*, Vol. iv, p. 23.)

It is described by Bentham (B.Fl. iii, 256) as follows :—

Usually a small or middle-sized tree, but sometimes attaining a great height, with a persistent furrowed bark (F. Mueller). *Leaves* ovate-lanceolate or lanceolate, acuminate, about 3 to 6 inches long, with numerous fine transverse parallel veins, often scarcely visible. *Umbels* loose, several flowered, mostly in a terminal corymbose panicle, the peduncles slightly compressed or angular. *Flowers* rather large, on pedicels of 2 to 4 lines. *Calyx-tube*, when open, broadly turbinate, 3 to 4 lines diameter, often dilated at the margin. *Operculum* short, hemispherical, umbonate or shortly acuminate. *Stamens* attaining 5 or 6 lines; anthers very small but ovate, with distinct parallel cells opening longitudinally. *Ovary* short, flat-topped. *Fruit* more or less urceolate, $\frac{1}{2}$ to $\frac{3}{4}$ inch long, usually contracted above the capsule and often expanded at the orifice, the rim narrow, the capsule sunk. Seeds large, ovate, more or less bordered by a wing, usually narrow.

It is figured and described (a) in Mueller's "Eucalyptographia," and (b) in Maiden's "Forest Flora of New South Wales," Vol. ii, p. 23.

The juvenile leaves have not previously been described. They are depicted in typical form at figs. 5 and 7a, Plate 161; and at fig. 6 the leaf is just progressing a shade in the direction of the intermediate broadish form which will eventually evolve into the lanceolate mature leaf. The juvenile leaf is shortly petiolate, almost orbicular (say about 5 cm. in diameter), a little longer than broad, with a short, small, pointed apex; the petiole deeply channelled, and it and the lamina more or less besprinkled with short hairs. Margins undulate. The secondary veins roughly parallel, but curved or looped inwards, with a fine network between the secondary veins.

The juvenile (sucker) foliage petiolate; also the young seedling foliage is petiolate.

The fruits vary in shape from urceolate (fig. 2, Plate 161) to ovoid (figs. 2, 3, Plate 162); in size (compare fig. 3b, Plate 161, with fig. 4, Plate 162). Particularly in Queensland, we have fruits smallish, spheroid, with seeds winged (not large wings), so far as I have seen them. Pedicels slender; fruit speckled. This latter character is suggestive of *E. dichromophloia*, but they are different from the fruits of that species, both in shape, texture, and colouring.

Scurfiness of Fruits.—The fruits are usually glabrous, but at the same time, particularly in the ovoid series, they are dull coloured and often scurfy. I submitted two duplicate sets of fruits to Mr. W. W. Froggatt, the Government Entomologist of New South Wales, and Dr. G. P. Darnell-Smith, the Government Biologist. They both informed me that this appearance is probably due to weathering, and that no insect or fungus action can be detected. As this phenomenon is especially seen in the Corymbosæ, it is apparently owing to the comparatively fleshy nature of the exterior of most of the fruits.

Vernacular Name.—This tree is the original Bloodwood of the early colonists, and it is perhaps as fortunate in its vernacular name as any of the Eucalypts. It exudes abundance of kino (popularly known as "gum"—hence "gum-tree"), and, when freshly exuded, this has all the appearance of a stream of blood. So freely does it flow, and so like blood is it, that sometimes the appearance of the ground at the foot

of one of these trees is quite startling. It is one of the few Eucalypts that enjoys but one vernacular name. At the same time, the name Bloodwood (sometimes with a prefix) is given to most members of the Corymbosæ.

Aboriginal Names.—"Mannen" was the aboriginal name of the tribes in the counties of Cumberland and Camden, according to the late Sir William Macarthur. Mr. Forester G. R. Brown states that its name amongst the blacks of the Port Macquarie district is "Bookeybarng," the word "barng" signifying "tree." In a catalogue of timbers, published many years ago, Mr. Charles Moore stated it to be the "Weni Aabic" of the aborigines of the Clarence and Richmond. By those of southern Queensland it used to be called "Boona." It was known as "Gooden" by the Koolaburra tribe between Tarrameo and Nanango, South Queensland, according to Dr. J. Shirley in *Proc. Roy. Soc. Q.*, xii, 7.

SYNONYMS.

1. *Metrosideros gummifera* Gaertner.
2. *E. oppositifolia* Desf.
3. *E. purpurascens* Link.
4. *E. longifolia* Link, not Link and Otto.

What is *E. corymbosa* Hoffmg. ?

1. *Metrosideros gummifera* Gaertner, in *De Fructibus*, vol. i, p. 17, and tab. xxxiv (1788). Unmistakeable drawings of the fruit. This was afterwards attributed to *E. resinifera* (see Part XXX, p. 208, of the present work). *E. corymbosa* is a notorious yielder of kino, and Gaertner's name would have been a useful one, while in translating it to *E. resinifera*, subsequent botanists thought they were following up the same idea. It so happens, however, that the tree now accepted as *E. resinifera* Sm. is remarkably free from kino.

2. *E. oppositifolia* Desf.

"Eucalyptus oppositifolia à feuilles opposées. New Holland, Or., (Desf. *Tabl. Ecol. Bot.* Ed. i, 1804, p. 222), is a synonym of *E. purpurascens* Link, var. *petiolaris* A.DC. according to DC. *Prod.* iii, 221. Var. *petiolaris* has been shown to be a synonym of *E. corymbosa* Sm.

This is confirmed by a large specimen in the opposite leaved stage in Herb. Mus. Paris, from the Jardin Noisette, 1812, presented by M. Bonpland in 1833. A second specimen in the same herbarium, presented by M. Bonpland in 1833, and labelled in very old handwriting "*oppositifolius*" [*sic*] is indeterminable. It is not *E. corymbosa*.

3. *E. purpurascens* Link, var. *petiolaris*, foliis longe petiolatis lato-lanceolatis. *E. oppositifolia* Desf. *cat. hort.*, p. 1804, p. 422. Ramuli teretes, petioli nervique foliorum fusco-purpurascens. Folia 3-4 poll. longa pollicem lata basi inæqualiter attenuata marginibus nervulo cinctis. (De Candolle, *Prodromus* iii, 221.)

Through the kindness of M. Casimir De Candolle I have examined the original specimen, which is in the opposite-leaved stage. The original label is "Eucalyptus, Jardin Noisette, 11 Juill. 1818," and endorsed "42 *E. purpurascens* Lk., var. *petiolaris*, DC." It is *E. corymbosa* Sm., and the name *purpurascens* is obtained, as the name indicates, from the purple venation and petioles.

(*E. purpurascens* var. *petiolulata* DC. is *E. amygdalina* Labill. See Part IX, p. 151, of the present work.)

4. *E. longifolia* Link.

A very fair drawing of a fruit of *E. corymbosa* is in Herb. Cant. It has a label bearing also the words:—" *E. longifolia* Lk., non Lindl. in Heward's Herbarium. Was gathered by A. Cunningham close under Blue Mountain, Waragamba " (*i.e.*, a few miles west of Penrith, N.S.W.).

What is *E. corymbosa* Hoffmannsegg?

I do not know what *E. corymbosa* Hoffmg. is, and as the work in which it is published is very rare, I transcribe what he says about it:—

(428) *Eucalyptus corymbosa*. Mea planta *E. obliqua* ita similis, ut primo intuitu eadem fere videatur. Attentius tamen examinata differt: Caule ramisque, praesertim adultis, stellato-pubescentibus, foliis adultis omnibus parumper magis subrepandis, inferioribus demum scabriusculis, margineque, praesertim ad basin, scabro, imo subspinuloso-ciliatis. At haec omnia in recentibus partibus non obvia, quae igitur in ambabus Spp. simillimae. Tamen et substantia in *E. c.* aliquanto minus rigide coriacea ac in *E. o.* mihi videtur, sed folia non lanceolata nisi summa nondum adulta; reliqua ramea, ut minimum, oblonga, perfectiora vero, ramos stipantia, fere vel ovata dicenda, 4-5' lg. 2' lt. (Hoffmg. *Verz. Pfl. Nachr.* 2, p. 113)

RANGE.

The type came from Port Jackson, at the site of modern Sydney, New South Wales. Benthams (B.Fl. iii, 256) extends its New South Wales range from Twofold Bay, near the Victorian border, to the Richmond River, near the Queensland border. In Queensland he gives it as far north as Rockhampton. All his localities are coastal.

Mueller, in the "Eucalyptographia," records its range from the "vicinity of the Genoa River (north-eastern Victoria) to Rockingham Bay (Queensland, say 18 deg. S. lat.), on dry ridges and hills or in open forest ground, ascending to considerable

mountain elevations in New England" (New South Wales). It does not, however, ascend to the higher parts of New England, being found in localities of lower or only moderate elevation.

The most northern locality from which I record it is the Atherton district, northern Queensland.

VICTORIA.

In considering Mueller's record of the Genoa River, eastern Victoria, for *E. corymbosa*, the same locality practically (as Mallacoota Inlet) is quoted by Mr. Charles Daley in *Vict. Nat.*, vol. xxxiv, p. 135 (January, 1918), but Mr. Daley's paper gives more detailed information as to its range. I have it from East Gippsland, no specific locality (E. Rowe, per C. Walter).

NEW SOUTH WALES.

Undoubtedly this species is most developed in this State, occurring from south to north, in hungry, sandstone country, rarely ascending to any great elevation. It is commonly found on the Hawkesbury sandstone formation. It is a common coastal species, and is plentiful on the Blue Mountains till the vicinity of Wentworth Falls is reached, after which the elevation, which is upwards of 3,000 feet above sea-level, appears to be too great for it.

I have seen the following historical specimens, probably all from the Sydney district:—

1. "Eucalyptus corymbosa. Botany Bay. Ex. herb. Lambert. Dr. Smith." A co-type in Herb. Cant. Ex Herb. Lemann.
2. A very old specimen, in old fashioned handwriting (circa 1800) on label in Herb. Barbey-Boissier "Eucalyptus corymbosa Cava" (Cavanilles).
3. No. 4777, R. Brown (1802-5), "East Coast."
4. "Bloodwood of the Colonists. Port Jackson. Cunningham." Herb. Cant. ex Herb. Lindl.

It is exceedingly common about Port Jackson, and on the hungry sandstone, or near the coastal sand, of the County of Cumberland generally.

Southern localities.—Twofold Bay, Oldfield. Herb. Cant. Specimen in Oldfield's handwriting in Herbar Barbey-Boissier. "Bloodwood. Tree 100-150 feet. Bark persistent, rough, brittle. Wood no use from gum-veins." Twofold Bay (Howitt). Bega district (J. V. de Coque). Moruya district (J.H.M.). Boyne State Forest, near Bateman's Bay (L. Walker).

Thence northerly along the coast. Jervis Bay (J.H.M.), also coastally to Port Jackson.

Heathcote, growing within 20 yards of each other (R. H. Cambage, Nos. 4170 and 4171). Both in fruit, and corky scaly. Those of 4170 smaller, more elongate and narrower. 4171 nearly ovoid.

Then we rise to the southern tableland, and illustrative localities are Braidwood to Nowra (J. L. Boorman); Box Point to Barber's Creek (J.H.M.); Hill Top (J.H.M.). Thence down the Southern railway more or less to Sydney.

Western localities.—Following are copies of George Caley's labels, specimens received from British Museum :—

(a) In flower. "8th February, 1804. The same with specimens of wood and gum. Alt." (Presumably collected by Surveyor-General Alt.)

(b) In flower. "Near Grose's Head, January, 1804," together with a word that looks like "granitic," but there is no granite in the immediate locality.

(c) In fruit, shiny and very urceolate.

(a) and (b) bear the British Museum reference number 41, and (c) 30. These three specimens were probably obtained near the Grose River, at the foot of the Blue Mountains. See remarks on the locality under *E. eximia*, to be published later.

On a sandstone ridge at Bent's Basin, Nepean River (J.H.M.). (This also is at the foot of the Blue Mountains.)

It then ascends the Blue Mountains, being more or less common along the road until Wentworth Falls (3,000 feet) is reached, after which the cold becomes too much for it. I have specimens from the following localities, descending the Mountains.

Jamieson Valley, near Wentworth Falls (W. Forsyth). Fruits urceolate, with a high shoulder. Scaly corky as age proceeds. Hazelbrook (J.H.M.). Faulconbridge (J.H.M.). It is common all down the Mountains on the sandstone.

Northern localities.—It is common between Port Jackson and the Hawkesbury River.

Tree of 150 feet. Bark rough and scaly to the large branches, then running out much smoother on the younger branches. Hornsby district (W. F. Blakely).

Milson Island, Hawkesbury River (J.H.M.). Gosford (J.H.M., A. Murphy). Fruits very urceolate. Seeds with solid angles, no wings.

It is more or less common from the Hawkesbury to the Hunter. "Strong clay soil, very high, 100–150 feet. Common in most parts of Port Stephens, Burnett." Herb. Cant. ex Herb. Lindley.

Then in poor sandy soil it is found, chiefly in coastal regions, going northerly to the Queensland border. The following are arranged, proceeding north.

Limeburners' Creek, between Raymond Terrace and Stroud (A. Rudder). Hastings River (Dr. Beckler). Labelled *E. terminalis* by Mueller himself. Fruits large, urceolate to ovoid, scurfy.

Smoky Cape, near mouth of Macleay (J. L. Boorman.) Fruits ovoid, scurfy, seeds a little winged. Anderson's Sugar Loaf, Macleay River (J. L. Boorman). One, if not the principal, species growing on and around the Sugar Loaf. Fruits smallish, narrowish, graceful.

Mr. Forester Mechain recorded it many years ago from swampy country in the Bellinger district, attaining the sizes 3 feet 6 inches to 4 feet 6 inches in diameter, and with a height of 120 to 150 feet.

"Bloodwood." Parish Moonee, County Raleigh, Woolgoolga. (E. H. F. Swain.) "Same as preceding," which he called "White Bloodwood."

Lawrence, Clarence River (J. V. de Coque). "Red Bloodwood," scaly rough bark. Range at Kangaroo Creek, 32 miles from Grafton (District Forester T. H. Wilshire). Rough scaly bark, Glenreagh, 28 miles south of Grafton (T. H. Wilshire).

Small fruits, probably collected by Wilcox or Beckler, Clarence River (named *E. corymbosa* by Mueller).

Fruit with a slight ridge. Casino (E. G. McLean). Alsterville Cutting, Richmond River (Rev. W. W. Watts). Byron Bay (J.H.M. and J. L. Boorman). Fruits ovoid, some elongate, all corky-scurfy. Byron Bay (A. H. Hammond). Young fruits, corky scurfy, which shrink in drying in a characteristic manner easily recognised.

"Splendid timber to last in the ground." Fruits varying in size. Acacia Creek, Macpherson Range. (W. Dunn, 2 E.C. 157.) In sending some specimens from Acacia Creek, Macpherson Range, close to the border, Mr. W. Dunn gets indignant. "This timber is of great value for lasting under ground; its other virtue is: will stand the sun without cracking. I doubt if ever this timber has received its just reward—timber ignorance and faddism preventing it from winning its way and coming to the front." This is an aspect of the subject that I have dealt with in my "Forest Flora of New South Wales."

Some of the Macpherson Range trees show small fruits, but such are even commoner in Queensland.

QUEENSLAND.

Queensland slopes of Macpherson Range (N. W. Jolly).

Blackbutt—Ipswich to Yarraman (N. W. Jolly, A. E. Wallin). Fruits small, seeds winged.

Called Red Bloodwood in contradistinction to the White Bloodwood (*Angophora intermedia*). Burpengary (Dr. T. L. Bancroft). Southport, Moreton Bay. Also Sandgate. Fruits small (Rev. J. H. Simmonds). Eight-mile Plains, near Brisbane (F. M. Bailey, A. Murphy). Fruits small, seeds winged.

"Typical Bloodwood. Fairly large trees of 40-60 feet, stems 4-6 feet, rough scaly bark." Waterworks-road, Brisbane (J. L. Boorman). Fruits of medium size. Brisbane. Fruits small (J. L. Boorman). Toowong, Chermside, and common round Brisbane (C. T. White).

With typical urceolate Port Jackson fruits, Woodford, Kilcoy line (N. W. Jolly).

Landsborough, North-coast Railway (P. McMahon). Gympie (L. Hirst).

"Bloodwood. Good for fencing." Maryborough. Fruits small (W. H. Williams); Maryborough West (P. J. McGrath). "Bastard Bloodwood. A stunted tree with large parts of the small branches smooth bark, small branches smooth. Grows in poor grass-tree country." (W. R. Petrie, No. 4, Fraser Island.) "A large tree, fruit same shape as No. 4, and large branches all carry rough bark, wood very durable in ground. Coppice practically all rough-barked. Grows on better land than No. 4, which may account for the difference." (W. R. Petrie, No. 5, Fraser Island.) I cannot see any difference in the herbarium specimens. The fruits are smallish and broadish, urceolate when green, but getting more ovoid and corky-scaly when old.

At Bundaberg *E. corymbosa* is known as Red Bloodwood in contradistinction to *E. trachyphloia*, the White Bloodwood (J.H.M.).

Rockhampton (A. Thozet, No. 584). Small fruited. (Labelled *E. terminalis* var. by Mueller.) Rockhampton (P. A. O'Shanesy, No. 60, series 4th). (Labelled *E. terminalis* by Mueller. Same as preceding.) Rockhampton (A. Thozet, No. 786). (Labelled *E. dichromophloia* by Mueller). Mt. Morgan (C. F. Henrickson). With larger fruits. Thirty-five miles north of Rockhampton (Emu Park line), near the sea. "A regular Bloodwood, with red wood." (A. Murphy.) Fruits small, corky scaly. Seeds flattened, winged.

On granite, Townsville. (R. H. Cambage, No. 3803.) A small fruited form.

Beach, Russell River, in flower only. (W. A. Sayer.) (Labelled *E. terminalis* by Mueller.)

Barron Falls, Cairns, fruits small. (R. H. Cambage, No. 3847.) Atherton, fruits small. (H. W. Mocatta.) "Bloodwood. Throughout northern Queensland, tall, straight-barrelled tree in parts, stunted in others, spreading branches, reddish brown scaly bark; timber red, showing numerous blood veins." Atherton. (H. W. Mocatta, No. 8.) Fruits small, somewhat scaly, and a little urceolate.

"East Coast." Fruits small. (Robert Brown, 1802-4.) [Variously labelled *corymbosa* and *terminalis* in the British Museum distribution of 1876.]

AFFINITIES.

1. With *E. terminalis* F.v.M.

B. n. tham says (B.Fl. iii, 256) :—

It is possible that some of the specimens (of *E. corymbosa*) here referred to may belong to *E. curicdora* [this is a misapprehension.—J.H.M.], or the northern ones to *E. terminalis* [this would probably refer to some of the Queensland ones; see this page.—J.H.M.], both of which it is often very difficult to distinguish from *E. corymbosa*. The figure usually quoted of *E. corymbosa* Cav. Ic. iv, t. 340, is a very indifferent one, and looks much more like *E. paniculata*.

The suggestion that it resembles *E. paniculata* is unfortunate. The old steel engravers did not trouble much about the venation of *Eucalyptus*, but the inflorescence, considering that it came from "prope oppidum Jackson," and was drawn from a shrivelled specimen is, in the Australian dialect, "not too bad." A portion of the figure will be found at fig. 4, Plate 161. It can be nothing else than *E. corymbosa*. The artist even shows the operculum hanging from the side of the calyx-tube like a hinge, which is characteristic of the Bloodwoods and allies.

Mueller remarks that—

This species, as far as here noticed, is restricted to the ordinary state in which it appears through the more littoral regions of New South Wales and southern Queensland. But the greatest embarrassment has arisen in specifying the limits by which *E. terminalis* (*E. pyrophora* Benth., B.Fl. iii, 257) may constantly be separated; thus Bentham already was inclined to consider both as forms only of *E. corymbosa*, a view which the accumulation of much additional material has almost confirmed. ("Eucalyptographia," under *E. corymbosa*.)

It will be observed that Mueller was doubtful as to the specific limits of *E. corymbosa*, *E. terminalis*, and *E. pyrophora*, but I think that I shall be able to make the matter clear when these species are referred to.

Then J. G. Luehmann, another competent authority, speaking of *E. corymbosa*, says:—

Including as varieties *E. terminalis*, *E. dichromophloia*, and *E. pyrophora*, as I find it impossible to draw a clear line of demarcation; the specimens from the dry interior and from the North-West have the leaves frequently of equal colour on both sides, and the fruits are occasionally rather ovate-truncate than urceolate. (J. G. Luehmann in *Proc. Aust. Assoc. Adv. Science*, vii, 526.)

It will be observed that Luehmann, Mueller's assistant for over thirty years, and who, besides knowing Mueller's views better than other botanists, was a close student of the genus himself, thought that *E. dichromophloia* was (in addition to Mueller's list) conspecific with *E. corymbosa*.

I will return to the subject in Part XL, since it is impossible to make the differences between *E. corymbosa*, *E. terminalis*, *E. pyrophora*, and *E. dichromophloia* clear without illustrations.

2. With *E. dichromophloia* F.v.M.

E. dichromophloia has the fruits considerably smaller, about the size of those of *E. trachyphloia* and *E. latifolia*, besides the bark seems always different, as the specific name implies, from that of *E. corymbosa* and *E. terminalis*, its upper thin smooth and pale stratum separating from the brownish-red thick layers below. ("Eucalyptographia," under *E. corymbosa*.)

While I agree with Mueller in keeping *E. corymbosa* and *E. dichromophloia* apart, it is necessary to point out that the fruits of the latter species may be so large as to constitute a real difficulty in the comparison with *E. corymbosa*. The relations of *E. corymbosa* and *E. dichromophloia* will be again referred to when the latter species is reached in Part XL, as it is necessary to have figures.

E. corymbosa is the earliest described, and the best known species of the Corymbosæ, and it is fitting to say here that later on, by means of a comparative table, and in other ways, it is intended to comprehensively bring out the relations of the various species of this interesting group.

3. With *E. urnigera* Hook. f.

E. urnigera, which bears in its fruit considerable resemblance to *E. corymbosa*, differs essentially in having the leaves dark green and somewhat shining on both sides, the latter moreover are provided with less spreading rather irregular and more distant lateral veins, a removed marginal vein and isogenous stomata, many of the flower-stalks are axillary, and bear mostly three or occasionally only two flowers, the tube of the calyx is more cylindrical turgid below the middle, and strongly constricted towards the rim, the lid is ampler than the orifice and seceding by a clear circumcission, the fruit is generally smaller, with more spreading rim, and the seeds are devoid of any appendage. It is moreover never a large tree, and is restricted to the sub-alpine zone of southern Tasmania.

E. urnigera is dealt with at Part XVIII, and figured at Plate 80. It is a small Gum, and not a Bloodwood, although we must remember that there are Gums even amongst the Bloodwoods. The two species differ in anthers, cotyledon-leaves and seedlings generally, but their affinities deserve a further statement, which will be made later.

DESCRIPTION.

CCVI. *E. intermedia* R. T. Baker.

In *Proc. Linn. Soc. N.S.W.* xxv, 674 (1900). With a figure of a fruit.

A medium-sized tree with a *light brown fibrous bark*.

Leaves lanceolate, acuminate, about 6 inches long, and 1-1½ inches wide or more, pale on the underside; lateral veins oblique, fine, numerous, parallel; intramarginal vein quite close to the edge.

Flowers mostly in large terminal corymbs. Calyx turbinate, 4 lines in diameter, 3 lines long, on a pedicel of about 4 lines. Ovary flat-topped. Stamens all fertile; anthers parallel, opening by longitudinal slits.

Fruits urceolate, about 6 lines long, 4-5 lines in diameter, contracted at the orifice to sometimes 2 lines; rim thin, capsule sunken.

In the original description, the words "light brown fibrous bark" are in italics, and form part of Mr. Baeuerlen's report on the Ballina specimens, evidence, as far as it goes, that these should be taken as the type.

"A pale coloured timber, hard, straight-grained and easy to work. It is much closer in texture than the Sydney Bloodwood (*E. corymbosa*). The figure is occasionally not unlike that of *E. maculata*. Gum-veins are not infrequent. It is considered a good durable timber, and superior to that of *E. corymbosa*. It has quite a metallic ring when the fractured edges of a piece are rubbed together." (Original description.)

The colour of the timber is pale red, but paler than that of *E. corymbosa*, and variable within limits. The name "White Bloodwood," as suggesting an absence of red colour, is misleading; "Pale" or "Pink" is better. I have seen specimens which dry so dark as to make the discrimination of the timber by colour somewhat difficult. In my "Forest Flora of New South Wales," xi, 27, I wrote—

The timber is, when fresh, of a pale pink, although in process of time it turns nearly as dark as ordinary Bloodwood (*E. corymbosa*). It seems also to have fewer kino-veins, and it is undoubtedly very much more fissile. It seems to be very much more sparingly distributed than ordinary Bloodwood.

Op. cit. p. 676, Mr. Baker compares the oils of *E. intermedia*, *corymbosa*, and *eximia*. Speaking generally, he places the first "about half-way between" *E. corymbosa* and *E. eximia*.

RANGE.

In the original description it is quoted from the following localities :—

- (a) Ballina (W. Baeuerlen).
- (b) Richmond and Clarence Rivers (Rev. Dr. Woolls).
- (c) Barney's Wharf, Cambewarra (W. Baeuerlen, P. Macpherson).

(a) The Ballina specimens should probably be regarded as the type. A specimen is before me (W. Baeuerlen, June, 1891, "Bark fibrous, light brown.") and is figured at 4, Plate 163.

(b) The history of the specimen attributed to the Rev. Dr. Woolls is as follows, but there is no evidence that he ever saw it. He got his information out of an exhibition catalogue, which he did not cite, nor were there any specimens in his herbarium which his widow presented to me. Following is a note I published in my "Forest Flora of New South Wales," Part xi, p. 27 :—

At the London Exhibition of 1862, Mr. Charles Moore, of the Botanic Gardens, Sydney, exhibited two samples of timber (marked lviii and lix in the Catalogue of New South Wales timbers), both from "Clarence and Richmond open forests." Both were called by the aborigines "Weni Aabie," and the former by the colonists "Rough-barked Bloodwood," and the latter "Smooth-barked Bloodwood." Thus they are described :—

(lviii) Prevailing to a great extent; a tree of considerable size. Timber of great strength, and very durable, both in and out of ground. Used principally for posts and beams. (lix) This and the preceding are mere varieties of the species, and only to be distinguished from each other (by the bark?). Both are equally common, and are used for the same purposes.*

The "Smooth-barked Bloodwood" is now more usually known as "White" or "Pale Bloodwood," and I desire to draw further attention to it.

The late Rev. Dr. Woolls, "Flora of Australia," p. 288, quoted Moore (without the reference), and observed that "Mountain Bloodwood" (*E. eximia*) is different from the Bloodwood of the north, which indeed it is.

(c) I have not seen specimens from Barney's Wharf, Cambewarra, but have seen some from the Shoalhaven, close by.

The range of the species is from the Victorian-New South Wales border (not far from the coast) to southern Queensland. I see no reason why it should not be found within Victorian territory, and further in Queensland.

". . . but in New England it seems to be noticed that the bark also becomes smooth and whitish from shelving off in flakes." ("Eucalyptographia," under *E. corymbosa*). This apparently refers to "Pale Bloodwood." But New England proper is a mistake, as *E. corymbosa*, or any other Bloodwood, only occurs at a lower elevation. Nor is the pale appearance of the bark caused by any deciduousness of the flakes.

The most southerly locality from which I have received specimens is Eden, Twofold Bay. "Called White Bloodwood locally as the timber is quite white when freshly cut, but dries a brownish tint. Grain of timber appears to be finer than the red wood. Fruits and general appearance of the trees apparently the same in this district." (Forest Guard H. H. Rose, Eden.)

The next in order going north are specimens collected by Mr. W. Baeuerlen, Collector for the Technological Museum, in August, 1890, in the Bateman's Bay district. I was Curator of the Museum at the time, and the specimens were referred to Mueller. They have been distributed as (a) Sources of the Clyde, Baeuerlen, No. 37, and (b) Mogo near Moruya, Mogo being 8 miles from the Bateman's Bay township, but the localities are practically the same. Baeuerlen labelled it "A supposed hybrid of *E. corymbosa* and *E. maculata*," and it has been already referred to.

* Quoted in Maiden's "Useful Native Plants of Australia," p. 441 (1859).

Then come certain localities in the Shoalhaven district detailed by Mr. Forester Rotton. See my "Forest Flora of N.S.W.," Part xi, pp. 27-8. These are all the southern localities with which I am acquainted.

North of Sydney we have Ph. Bohnock, County of Gloucester (District Forester Hardiman, of Taree). In sending specimens he said :—

As you will observe, there is a marked difference between the leaves of these two specimens—the ordinary having a very wide leaf, whilst that of the Pale is long and narrow. [Mr. Hardiman is now dead. As an observer he was far above the average, but his herbarium specimens do not bear out his statement.—J.H.M.] The White Bloodwood is found almost exclusively near the coast, and is of stunted growth. It is mostly used for the felloes of wheels.

Then comes a River Hastings locality quoted by me in *Agric. Gaz.*, Sept., 1895, p. 604; also "Forest Flora," xi, 28.

"The tree from which the specimen was taken showed timber of the palest hue I have seen in Bloodwood, and is possibly what has been called White Bloodwood." Mature leaves and large, nearly ovoid fruits with scurfy and rather corky exterior. Seeds winged. Fernmount, Bellinger River (E. H. F. Swain). Mr. Swain, in another communication, referring to the ovoid fruits, says that they seem less urceolate than those of the ordinary Bloodwood (*E. corymbosa*) of the district, but reference to page 255 shows that the shape of the fruit is not a reliable character.

Glenreagh, 28 miles from Grafton, on the Coff's Harbour road. Mr. District Forester T. H. Wilshire says of it :—

The Pale Bloodwood is used in culverts and blocks for buildings, and both extensively for posts it being recognised as a very durable timber for ground work.

The smooth and rough sealy bark Bloodwoods were obtained from Glenreagh. I am unable to notice any distinct difference in the flowers or leaves. There is, however, a very distinct difference in the bark and wood, the rough bark showing a much deeper white sap and brighter colour.

The "smooth" is *E. intermedia*, and the "rough" is *E. corymbosa*.

I sent the Botanic Gardens Collector (Mr. J. L. Boorman) to Glenreagh, in company with Mr. Wilshire, and following is Mr. Boorman's report :—

We went to Nana Glen and thence on to Glenreagh. This journey was to obtain specimens of "White Bloodwood" from the same locality as Mr. Wilshire obtained specimens on a former occasion, but the "White Bloodwood" is but the typical (*E. corymbosa*), considered "White" only by reason of the less burned appearance of the stem, and in no other respect differs from the type. I obtained only a piece of timber and a few fruits, as they were all large trees, and in fruit only. A Mr. Crabb (an old resident of the district, and the one responsible for the name "White Bloodwood") knows of no other "Bloodwoods" but the one in question, also Mr. Lawrence and Mr. Swain know only of these trees.

His label is "Tall trees of 60-80 feet high, known locally as White Bloodwood, by reason of the greyish colour of the bark. In all [? other.—J.H.M.] respects identical with the common Bloodwood." Glenreagh, near Coramba (J. L. Boorman).

"Bastard Bloodwood." Pale pink-coloured hard wood, flaky bark. Fruit tending to ovoid, scurfy. Ballina (W. Baerlen). Type of *E. intermedia*.

QUEENSLAND.

"White Bloodwood. Large trees, with dense foliage, bark persistent, spongy fibrous. Fruits long, pitcher shaped, wood of a grey colour, hard and heavy." Eight mile Plains (J. L. Boorman), 1901. Chermiside, near Brisbane (C. T. White).

"The 'White Bloodwood' specimens from Cooloolabin, Blackall Range, are so named on account of the colour of the timber, which is pale coloured, almost white, not red." (C. T. White.) They have urceolate fruits, as will be seen on reference to figure 6, Plate 163.

AFFINITIES.

1. With *E. corymbosa* Sm.

A tree closely allied to both *E. corymbosa* and *E. eximia*. It has, however, always been considered as the northern form of the former species [this is hardly a correct interpretation of the evidence.—J.H.M.], but in botanical characters it more nearly resembles the latter, and especially *E. maculata*. The chemical constituents and optical features place it midway between the two former. It differs from *E. corymbosa* in the nature of the timber, bark, oil and fruits, which have not the marked recurved rim of this species. (R. T. Baker, *op. cit.*, p. 674.)

The shape of the fruit in *E. intermedia* is not yet settled (see page 254). If the describer insists that the fruit is ovoid and not urceolate as well, then I do not understand the species. Personally, I justify the separation of the two species on bark and timber, and we must continue our enquiries.

2. With *E. eximia* Schauer.

From *E. eximia* it differs in having pedicellate fruits, a stringy flaky bark, a pinkish timber, and in its chemical constituents. (R. T. Baker.)

See also the same author's remarks under *E. corymbosa*.

Its physical characters, however, are so evenly balanced between the two [species] that it is decided to give it specific rank. (R. T. Baker.)

The two species are very different, *E. eximia* being an indubitable yellow bark with sessile inflorescence, and in its shiny buds and also its fruits it differs very widely from *E. intermedia*.

3. With *E. maculata* Hook.

Its fruits are exactly identical in size and shape with those of *E. maculata*, but it resembles this Spotted Gum in no other characters. (R. T. Baker.)

I do not agree with this pronouncement in regard to the fruits of *E. maculata*, which will be understood better when that species is reached. *E. maculata* is a smooth-barked species, with paler timber than *E. intermedia*. The species also differ in their buds.

4. With *E. terminalis* F.v.M.

It differs from *E. terminalis*, the Bloodwood of the interior, in its bark, timber and oil. (R. T. Baker.)*

5. With *E. trachyphloia* F.v.M.

It differs "from *E. trachyphloia* in its larger fruits, bark and chemical constituents." (R. T. Baker)

In morphological characters the two species are as far apart as are *E. intermedia* and *E. eximia*, but in different ways.

Is it a distinct species?

The first specimens of the Pale Bloodwood whose existence in collections is known, were sent from Bateman's Bay (Clyde River), and this is what Mueller said about them:—

Mr. Baeuerlen has sent from near the Clyde also specimens of an Eucalypt, which he considers a hybrid between *E. corymbosa* and *E. maculata*, in which case the characteristics of the former are prevailing; the leaves, however, are generally narrower, the operculum is double, like that of *E. maculata*, and it separates by a clear transverse line; the wood also was found much lighter in colour than that of the genuine *E. corymbosa*, and the bark smooth on the upper portion of the stem as in *E. maculata*. The flowering time proved later than that of the former; as many as 16 flowers occur in an umbel; the fruits are generally not so long as those of *E. corymbosa*. (*Vict. Naturalist*, Oct., 1890.)

Mr. Baeuerlen had himself suggested the hybrid nature of the plant, but Luehmann, Mueller's assistant, and a competent investigator of the genus, wrote on the Melbourne Herbarium specimens:—

I do not see any character to distinguish the specimen from *E. corymbosa* except that sometimes the flowers are more numerous in an umbel than hitherto observed (up to sixteen) and that a double operculum is noticeable. The difference in the bark and wood is probably quite accidental, as it is in so many other instances.

In 1890 I got an answer from Mueller to that effect, and accepted it, as I could not see any sufficient or consistent botanical differences between the Red (*E. corymbosa*) and Pale Bloodwood specimens collected, either then or subsequently.

Some bushmen call it "Bastard Bloodwood," which may or may not mean that they consider it a hybrid.

It seems always to occur with or near *E. corymbosa*, and the suggestion that it is a hybrid between *E. corymbosa* and *E. maculata* (which in many districts occurs at no very great distance from the former) is not unreasonable, but I will go into the matter again when I deal with the general question of hybrids.

As we cannot, in the present state of our knowledge, separate the two Bloodwoods (*E. corymbosa* and the present one) on botanical grounds, we must fall back on the appearance of the bark and timber. But a small percentage of specimens can, in the nature of things, be backed with such material, and in the absence of such, or of evidence in regard to bark or timber, they must be labelled *E. corymbosa*.

I think, however, we should recognise *E. intermedia*, although we have no strict precedent, hoping that, when we get complete material (e.g., juvenile leaves, often difficult to get in the Corymbosæ) our eyes may be opened to see distinctive morphological characters which are at present not obvious to my eyes, at least.

*The term "Bloodwood of the interior" had better be reserved (at all events in New South Wales) to *E. pyrophora*, a very different species. *E. terminalis* will be figured in Part XL, and the similarities and dissimilarities be better understood then.

DESCRIPTION.

CCVII. *E. patellaris* F.v.M.

Journ. Linn. Soc. iii, 84 (1859).

FOLLOWING is a translation of the original :—

A tree with somewhat terete branchlets, scarcely angled at the apex, *leaves* alternate, moderately petiole, narrow lanceolate, subfalcate, attenuate-acute, covered with scattered pellucid dots, somewhat shining, with faint veins, peripheral vein somewhat close to the margin, *umbels* terminal and axillary, 3-7 flowered, peniculate in two or many flowers. *Peduncles* somewhat terete, a little or twice as long as the angular pedicels. *Calyx-tube* campanulate, the same length as the pedicel and twice as long as the patellar umbonate operculum. The *valves* of the four-celled capsule entirely exsert.

Near drying creeks at the Roper River. Flowering in the summer.

A fairly tall tree, like *E. microtheca* in habit. Bark dirty grey, wrinkled and cracked, persistent on the trunk and branches. Leaves 3-6 inches long, $\frac{1}{2}$ -1 inch broad. Peduncles 1 inch long or shorter. Calyx-tube about 4 lines long, somewhat green. Operculum brownish, coriaceous. Valves adnate to the margin of the calyx.

Then Bentham (B.Fl. iii, 244) describes it in the following words, doubting, by the way, its specific rank :—

A tall tree with a rough furrowed persistent dull whitish bark (F. Mueller). *Leaves* lanceolate, falcate, acuminate, about 4 to 6 inches long, the veins rather numerous and regular, oblique, the intra-marginal one rather distant from the edge. Perfect flowers unknown. *Inflorescence* perhaps compound. *Calyx-tube* (only seen in a diseased persistent bud) hard, hemispherical, about 5 lines diameter, the border prominent. *Operculum* much depressed, umbonate. Fruit pedicellate, broadly urceolate, about 5 lines diameter, the orifice dilated, the rim broad and flat, the valves protruding.

RANGE.

The type was collected at the Roper River, which runs through the Northern Territory, and flows into the west side of the Gulf of Carpentaria.

The only specimen which appears to have been preserved, and which is at Kew, is endorsed "Upper part of the Roper River, 3rd July, 1856."

AFFINITIES.

In B.Fl. iii, 244, Bentham puts a query mark before the name, and adds—
“described from specimens far too imperfect to determine the affinities.”

J. G. Luehmann, in *Proc. Aust. Assoc. Adv. Science*, vii, 535 (1898) says—
“Described from too imperfect material to make recognition at all certain.”

The original is at Kew; there is no specimen at Melbourne, only a drawing, made from the specimen at Kew, similar to a drawing made for Sydney many years after.

The species is of uncertain relations, and it is hoped that the drawing may lead to its recovery by collectors in the Northern Territory.

1. With *E. rudis* Endl.

Bentham (B.Fl. iii, 197) contrasts it with *E. rudis* in the following words, and probably the suggestion is as good as can be made, in view of the paucity of the material and of the particulars concerning it.

Leaves long-lanceolate, with numerous, rather regular oblique veins, and more or less reticulate.
Fruit rather large.

Fruit with a broad flat dilated rim, the valves protruding. Tropical species ... *E. patellaris*.

Fruit with a narrow rim, the capsule somewhat sunk, the points of the valves
protruding. Western species *E. rudis*.

2. With *E. maculata* Hook.

It will be observed that the calyx-tube is warted, as in *E. maculata*, but in no other respects, so far as I know, does *E. patellaris* present resemblance to a member of the Corymbosæ. The fruits are, of course, widely different.

DESCRIPTION.

CCVIII. *E. celastroides* Turczaninow.

In *Bull. Phys. Math. Acad. Petersb.*, Vol. x, p. 338 (1852).

See Part III, p. 79, for a copy of the original Latin description, and the following (hitherto unpublished) translation into English will be useful :—

Drummond's 5th Collection (No. 34). Glabrous, branches terete, subangular in the upper part; leaves alternate linear-lanceolate, narrowed at both ends, suddenly and shortly acuminate, somewhat inæquilateral, marginate, indistinctly 3-nerved and veined; umbels axillary, 3-6 flowered; peduncles angular, about as long as the petiole, three times longer than the pedicels, and slightly longer than the calyx tube; calyx tube obconical, 4-ribbed, four times as long as the depressed hemispherical operculum. Leaves 2 inches long or a little longer, 3-3½ lines broad, covered with opaque dots sometimes, at others with blackish, and at other times with rather few pellucid ones; petiole almost 3 lines long. Filaments white. The fruiting calyx slightly enlarged, slightly constricted near the orifice. Capsule included, vertex smooth, 4-celled. It is close to the description of *E. amygdalina* Labill., in many things, but I see no reticulation in the leaves, the leaves are shorter, the operculum depressed and not subconical, perhaps also the form of the operculum distinguishes it from others. *E. (c) neorifolia* and *E. stricta* differ in having sessile flowers. *E. pallens* in having compressed peduncles and leaves 5 inches long. *E. obtusiflora* coccate calyx-tubes.

It is figured at Plate 10, Part III of the present work, so that an additional figure (except of the sucker leaves) is unnecessary. These sucker leaves will be found at fig. 8, Plate 163. They are glaucous, thickish, broadly lanceolate, and markedly triplinerved.

Then we have (translation). "This species, with its minute flowers and very short operculum, is quite distinct. There may be added to the original description :—A tree up to 20 metres (65 feet) in height; the bark handsome, ash-coloured, rough, when young smooth, whitish-ash coloured or shining reddish; primary leaves opaque white-glaucous, distinctly 3-nerved, broader than the adult shining ones." (Diels and Pritzel, in *Engler Jahrb.*, Vol. 35, 438, 1905.)

SYNONYM.

E. calycogona Turcz., var. *celastroides* Maiden; this work, Part III, p. 79 (1903).

RANGE.

It appears to be confined to Western Australia, but I expect it to be found in South Australia, adjacent to the Transcontinental line. It is a dry country species, and has not hitherto been recorded west of Rabbit-proof Fence No. 2, *i.e.*, near Tammin. Going east, our localities roughly follow the railway line to Kalgoorlie, and thence north to Goongarrie. North-east of Kalgoorlie we know it from the Fraser Range and some distance further east.

The Victorian localities quoted in Part III belong to *E. fruticeorum*.

It is Drummond's No. 34 (5th Coll.), 1849.

The following are authenticated localities :—

Elder Exploring Expedition, (a) Camp 63, W.A., 27th September, 1891, and (b) 40 miles north-west of Fraser's Range, 4th November, 1891 (both R. Helms). These specimens were labelled *E. foecunda* by Professor Tate. They have leaves rather broader than the Coolgardie specimens, see Plate 10 (b).

(a) Turning to the Journal of the Expedition, p. 112, we find that the expedition was at the Ponton River, and the leader speaks of seeing Blackbutt at the camp, and that it "is a most useful timber, very hard, dense, splitting very straight; the natives make their spears out of it."

(b) This is Camp 71, and the Journal (p. 128) records ". . . We came to a big patch of splendid Blackbutt timber. . . . The Blackbutt timber is of the Eucalyptus species (genus); it is a useful timber, splitting easily. The natives make their long spears out of this wood."

Following are field notes of trees from three localities, made by myself in 1909 :—

(1) Two feet in diameter, box-like bark, smooth branches, fruit rather small (as small as *E. gracilis* often is). Foliage somewhat pendulous. Kalgoorlie.

(2) "White Gum" or "Blackbutt." Suckers glaucous (stems square), medium-broadish. Timber cigar brown, a little bark (rough) at butt, smooth above. Fruit urceolate, somewhat like *E. gracilis*, but quite different from "Snap and Rattle," (*E. gracilis*). Lannin's timber camp, about 70 miles north of Kurrawang.

(3) "Blackbutt," 18 inches in diameter, 30 feet high, more or less pendulous. Branchlets glaucous. Did not find suckers. Rough bark extending more up trunk than *E. Clelandi*, which is more fibrous flaky than the present form. Goongarrie, 54 miles north of Kalgoorlie.

E. celastroides may be briefly described by foresters as a coarse form of *E. gracilis*.

Coolgardie (L. C. Webster), see Plate 10 (c). Coolgardie district near Southern Cross. Now infrequently in open muddy soil, flowered and fruited May (*E. Pritzel*, *Pl. Austr. occ.* 332; D. 2843); near Bullabulling, in muddy, stony soil, fruited October (D. 5220). Diels and Pritzel, *loc. cit.*

Yilgarn (W. V. Fitzgerald).

Kellerberrin (W. V. Fitzgerald). Habitat in the Avon district, near Tammin, in muddy eucalyptus tracts; fruits in the month of May (D. 3127). (Diels and Pritzel.)

AFFINITIES.

1. With *E. gracilis* F.v.M.

The differences appear to be as follows :—Both are trees (in Western Australia) of medium size, with brown timber.

	<i>E. gracilis.</i>	<i>E. celastroides.</i>
<i>Juvenile leaves</i> ...	See under <i>E. gracilis</i> , p. 263.	Coarser, with often thicker leaves and venation more prominent.
<i>Branchlets</i> ...	Slender, round, scarcely angular.	Commonly angular, often quadrangular.
<i>Mature leaves</i> ...	Shiny.	Dull or glaucous.
<i>Flowers</i> ...	Anthems of <i>E. calycogona</i> , <i>E. gracilis</i> , and <i>E. celastroides</i> alike.	
<i>Fruits</i> ...		Larger, sometimes much larger, sometimes more urceolate.

2. With *E. fruticetorum* F.v.M.

In Part III, p. 80, of this work, I considered this species to be a synonym of *E. celastroides*, but the finding of better specimens of the former in the Melbourne Herbarium has caused us to precisely know what *E. fruticetorum* is. Reference to Part XI, p. 42, of the present work, and to Part XLII, p. 26, Plate 156, of my "Forest Flora of N.S.W.," are sufficient to show their great superficial resemblance. The sucker leaves sharply separate them, those of *E. fruticetorum* being narrow, and those of *E. celastroides* much broader. The fruits also of the latter species are urceolate, and *E. celastroides* is a moderately large tree.

3. With *E. hemiphloia* F.v.M., var. *microcarpa* Maiden.

This variety is described at p. 17, Part XI of the present work, and figured at Plate 50. It will be seen at once that there is some resemblance between the variety and *E. celastroides* in the fruits, while the mature leaves sometimes present resemblances. The juvenile leaves are less triplinerved in the variety. Both are medium-sized trees, but the bark of the variety is more fibrous, but this is a comparison not always easy to make. The timber of *E. celastroides* is cigar-brown, deeper coloured than that of any form of *E. hemiphloia*.

4. With *E. Dundasi* Maiden.

There are several Blackbutts in the inland parts of Western Australia, the name being widely used. While *E. celastroides* is so named, *E. Dundasi* (see Part XXXIII) is also a Blackbutt, whose range approaches that of *E. celastroides* in the Kalgoorlie district. I think the two species are distinct both as regards foliage and buds, but considering the paucity of the *E. Dundasi* material available, I would invite the attention of collectors to the matter, in order that ample material of *E. Dundasi* may be collected, and its biological relationships investigated.

DESCRIPTION.

CCIX. *E. gracilis* F.v.M.

In *Trans. Vict. Inst.* i, 35 (1855).

THE brief original description will be found at Part III, p. 81, of the present work, and the species is adequately figured at Plate 12.

Subsequently to the original description, Mueller named specimens (which were later ascertained to be Turczaninow's *E. calycogona* and *E. celastroides*) as *E. gracilis* or forms of it. In his "Eucalyptographia," under *E. gracilis*, he gives the two former names as synonyms, but ignores questions of priority; indeed, he mentions *E. calycogona* and *E. celastroides* no further. He does not even admit them on his Plate.

Then came Bentham's description of *E. gracilis* in B.Fl. iii, 211 (1866). Unfortunately, Turczaninow's researches on Eucalyptus (referred to at Part III, p. 77) were not known to Bentham, although we see that he had Drummond's 184 (*E. calycogona* Turcz.) and Drummond's 34 (*E. celastroides* Turcz.) before him. These names were unknown to him, and he followed Mueller in placing these forms under *E. gracilis*.

In *Proc. Roy. Soc. N.S.W.*, vol. lii, p. 488 (1918), I have made some of the following statements:—

It would appear that there are two more or less defined forms—

(a) That of South Australia, Victoria, and New South Wales.

(b) That of Western Australia.

(a) *E. gracilis* F.v.M. (see copy of original description in C.R. III, 81) came from the "desert of the Murray River" (we no longer look upon the "Mallee country" as desert), and whether from South Australia or Victorian territory, we do not know. We have matched the type from both sides of the boundary-line. We have now collected from a number of localities, chiefly in South Australia.

(b) Let us turn to the Western Australian form. I have given some notes, more or less referring to it, *Journ. Roy. Soc. N.S.W.*, xlix, 324. For an account of the tree, and its juvenile leaves, see my description in *Journ. W.A. Nat. Hist. Soc.* iii (January 1911).

Comparing (a) and (b), there is some local variation in the width of the leaves. The broad-leaved form of (a) may have leaves as wide as those seen in (b), but the buds and fruits of (a) are larger and of a different shape. The fruits of (a) are more obconic, and the buds clavate—not cylindroid as in (b).

Speaking generally, we may say that (*b*) differs from (*a*) in the broader and thinner leaves, the longer and more slender peduncles and pedicels, in the less clavate, more cylindroid buds, and also in the uniformly smaller fruits, which have some tendency to be urceolate. Form (*b*) seems to be more uniform in character than (*a*).

I venture to look upon (*b*), or the Western Australian form, as a variety, and therefore suggest the name *Yilgarnensis*, i.e., *E. gracilis* var. *Yilgarnensis* for it, following Diels. See Part III of this work, p. 82.

At present it seems to me that there is not sufficient evidence to keep (*a*), the New South Wales, Victorian and South Australian *gracilis* specifically apart from (*b*), the Western Australian form. They both attain the magnitude of medium-sized trees, and in South Australia it has recently been noted as large, or larger than in the western State.

The attention of our Western Australian and South Australian friends may be invited to the problem, particularly in regard to variation in the species in eastern Western Australia and western South Australia localities, when the whole matter can be reviewed.

As regards the juvenile leaves of *E. gracilis*, the branches are angular; leaves oblong to oblong-lanceolate, 1 to 2½ inches long, ½ to 1 inch broad, veins numerous, often distinctly trinerved, the intramarginal vein usually distant from the edge; occasionally one or two lateral veins almost parallel with the midrib as in the adult foliage, the smaller ones at an angle of about 60 degrees, and again variously branched; lower petioles short, compressed, the upper ones more terete.

In *Journ. W.A. Nat. Hist. Soc.*, Vol. iii (January, 1911), I contrasted the sucker leaves of what I now look upon as (*a*), var. *Yilgarnensis*, and (*b*) *E. gracilis*, normal form, in the following words:—

(*a*) The juvenile leaves [I am describing specimens from Southern Cross, W.A.—J.H.M.] are glaucous on both sides, acuminate, tapering to a rather long petiole, lanceolate, the lamina say 3 inches long by ¾ inch broad, the intramarginal vein at a very considerable distance from the edge, venation spreading, the midrib and intramarginal vein being most conspicuous, giving the leaf a triplinerved appearance.

(*b*) So far as I am aware, the juvenile foliage of var. *gracilis* (*E. gracilis*) has not been previously described. Some from Euston to Mildura, Victoria (W. S. Brownscombe) (not far from the type locality) are smaller, and from nearly elliptical to oblong in shape. They do not taper to a point, but are of the same general character as those already described. Then I have juvenile foliage from South Australian localities, collected by myself, which is narrower in width, but as it is not in as early juvenile stage as that described by me from Western Australia, I invite attention to the matter in order that representative specimens may be collected.

SYNONYMS.

1. *E. gracilis* F.v.M., var. *breviflora* Benth. (B.Fl. iii, 211).
2. *E. calycogona* Turcz., var. *gracilis* Maiden in Part III, p. 81.
Var. *Yilgarnensis* (Diels) Maiden, in *Proc. Roy. Soc. N.S.W.*, vii, 489 (1918).

RANGE.

(a) Normal Form.

It attains its widest distribution in South Australia, having been recorded from as far north as Beltana, on the Oodnadatta Line, and as far west as Fowler's Bay, on the Great Australian Bight, not far from the Western Australian boundary. In the Murray River district, thence northerly to the Petersburg and Flinders Range districts, it is not uncommon. Thence turning south and westerly, it is found in Eyre's Peninsula, and joins up with the Fowler's Bay locality.

In Victoria and New South Wales it keeps fairly near to the Murray, continuing the South Australian localities. In the latter State Euabalong, in the Condobolin district, and Griffith are more inland localities. It is a dry-country species.

SOUTH AUSTRALIA.

Murray Scrub (Behr), ante Part III, p. 81. A small tree growing on Murray Scrub (J. M. Black). Ninety-mile Desert. "Clear bark, wood brown." (R. H. Cambage, March, 1901). The Ninety-mile Desert is the modern name for the Murray Desert, where the type of the variety was collected. Timber brown. Murray Bridge (J.H.M.). River Murray, chiefly 15 miles east of Morgan (Dr. J. B. Cleland).

"White Mallee" Naekara (via Petersburg). (Walter Gill).

Moolooloo Station, between Beltana and Blinman (Mrs. R. S. Rogers).

York Peninsula (J. G. O. Tepper, 1880, No. 938). "Middle-sized trees, 10-20 feet by 3-8 inches, coast plain." (Herb. Melb.)

"White Mallee," Flinders Range, foothills of Mt. Brown (Port Augusta); W. Gill, Conservator of Forests, with the note "as figured in Brown's 'Forest Flora of South Australia.'"

"Red or White Mallee." A medium-sized tree, often only with one stem, of 4-8 inches in diameter. Scrub in Hundred of Baroota, western side of Flinders Range (J. M. Black).

Boston Island; also Stamford Hill, Port Lincoln; Robert Brown collected here in 1802 (J.H.M.). Cape Donnington, Port Lincoln (Dr. R. S. Rogers). Memory Cove, Port Lincoln (J.H.M.).

Karoonda, Hundred of Hooper, Eyre's Peninsula (W. J. Spafford, No. 19).

"Kong Mallee." "This Mallee in most cases grows on the edges of Spear-grass plains, or at all events never in very dense masses as do some of the other Mallees. The clumps of stems on individual roots seldom exceed four in number, and as often as not are single-stemmed trees attaining to as much as 3 feet in diameter at a foot from the ground, and reaching 70 feet in height. These latter figures are actual measurements of trees we have pulled out at our Experimental Farm. Timber said to make good fencing posts; we are using it for this purpose, but have not had long enough experience to speak emphatically on this point." Hundred of Minnipa, about 160 miles north of Port Lincoln (W. J. Spafford, No. 8).

"A tree with smooth white bark on upper stem and branches, but with rough peeling bark on lower part of stem. Minnipa (J. M. Black).

Sandhills east of Ooldea, Transcontinental Railway Survey. A graceful Mallee of about 20 feet, "Congel" of the blacks, who eat the bark of the root. A dwarf, comparatively sturdy Mallee, Streaky Bay, South Australia (Henry Deane).

Fowler's Bay (Dr. R. S. Rogers). At no great distance from the Western Australian boundary.

VICTORIA.

Mildura (A. W. Howitt's No. 130). See Plate 9 (e). The Wimmera (C. Walter). See Plate 12 (e, f). Swan Hill (Dr. Griffiths).

"Black Mallee." Height up to 40 feet. Very plentiful between Euston and Mildura, off the sandhills on the lower ground, in company with *E. dumosa*. Fruits slightly angled (W. S. Brownscombe No. 13a).

NEW SOUTH WALES.

Gol Gol, near Wentworth ("No. 3, Mallee," A. W. Howitt). With slender, rather tapering fruits; the leaves and buds precisely those of Tepper's 938 (South Australia).

Mt. Hope Road to Euabalong, Condobolin district (August, 1899; R. H. Cambage). The Mallee referred to (see Plate 11, a, b) in Mr. Cambage's paper, *Proc. Linn. Soc. N.S.W.*, 1901, p. 209.

"Mallee" Line 61, Lake View, Griffith; also Line 9900, Griffith (W. D. Campbell, L.S.).

(b) Var. *Yilgarnensis* (Diels) Maiden.

The Western Australian localities for the reputed variety practically join on the South Australian ones for the normal species. With the exception of the Eucla specimens, those already collected practically follow the gold-fields line from Kalgoorlie as far west as the Beverley district. The variety will probably be found from near the coast to a considerable distance north of the railway line referred to.

WESTERN AUSTRALIA.

"Grey Mallee," Eucla. (J. H. Batt and S. Oliver in Herb. Melb.)

Kalgoorlie (Dr. J. B. Cleland). On the Kurrawang wood line, at a distance of nearly 70 miles north of Kurrawang, I found a large tree, known as "Snap and Rattle Gum," in abundance. The Kurrawang form (and it is common in the drier parts of Western Australia) is over 2 feet in diameter, but not tall, and grows in divaricate clumps, but not Mallee like.

It has flaky (thin Box-like) bark at butt, smooth above, and like so many of the gold-fields Eucalypts, a deep cigar-brown timber. In the Kurrawang district it is always a rotten tree, not of much account as a fuel wood, being full of pipe and dirt. It gives great heat and hence good for loco. fuel, but it is too dwarf and crooked for the mines. (J.H.M.)

"Tree about 8 m. (26 feet) high, with minute, white flowers. Southern Cross in limoso-lapidosus, 19th May, 1901." (L. Diels, No. 2843). See Plate 12 (*g, h, i*). "332, *Eucalyptus yilgarnensis* Diels. Yilgarn and Coolgardie Gold-fields; in very open woods, May, 1901." (E. Pritzel.)

Coolgardie (Nos. 100 and 101, 1899; R. Helms). Sap-green leaves, very shiny; fruits small, pear-shaped, constricted at the mouth, but not ripe; operculum a little pointed. See Plate 12 (*k, l*).

Fifty miles west of Golden Valley, W.A. (E. Merrall, 1888; in Herb. Melb.).

Tree of 20 feet, Kununoppin (Dr. F. Stoward, No. 149).

"Known as Morrel in the district. A tall tree of 50 or 60 feet, trunk with rough persistent bark, upper branches smooth. Grows in forests, amongst Gimlet (*E. salubris*) and Salmon Gum (*E. salmonophloia*), but more plentiful than the other so-called Morrel. No. 1041, *E. longicornis*. Cow Cowing (Max Koch, No. 989 and 986).

Tammin (Dr. C. H. Ostenfeld, No. 511). Cunderdin (W. V. Fitzgerald).

"Parker Gum" of the new settlers, but erroneously so. Yields a hard timber which does not crack in the sun, and is used as swingle-trees, &c., by the settlers; if put in the ground it is quickly attacked by white ants. It occurs in the patches of good land which are found at intervals along the course of the Salt River—strung upon the river, so to speak, "like beads on a string." Near Salt River, 10 miles east of County Peak, Beverley. (H. St. Barbe More, through H. O. Sargent, No. 708.)

AFFINITIES.

The affinity of this species is undoubtedly with *E. calycogona* Turcz. and *E. celastroides* Turcz.

1. With *E. calycogona* Turcz.

This species is figured at Plate 9 (Part III), and at figure E of that Plate is shown one of the forms intermediate between it and *E. gracilis*. I have referred to the gradations at page 81 of that Part.

I have compared the juvenile leaves (suckers) of *E. calycogona*, Parilla Forest, S.A., W. Gill, June, 1918, with those of *E. gracilis*, Karoonda, Hundred Hooper, S.A., W. J. Spafford, No. 19, and the only difference I can find is one of roughness, which appears to be referable to the more numerous oil dots in the leaves of *E. calycogona*.

Those of *E. gracilis*, Lake View, Griffith, N.S.W., W. D. Campbell, are almost identical with W. J. Spafford's No. 19. They are a little immature, but the outline and venation are the same as in the South Australian specimen. These observations alone show the close relations of *E. calycogona* and *E. gracilis*. Mueller, indeed, labelled typical *E. calycogona*, *E. gracilis*. In *Journ. Roy. Soc. N.S.W.*, xlix, p. 324, I refer to an intermediate form, and add Euston to Mildura, V. (W. J. Brownscombe). But *E. calycogona* seems so different from *E. gracilis* in the angular flowers and fruits.

2. With *E. celastroides* Turcz.

Some differences between this species and *E. gracilis* have been already drawn attention to under *E. gracilis*, see p. 261.

DESCRIPTION.

CCX. E. transcontinentalis Maiden.

In *Journ. Roy. Soc. N.S.W.* liii, 58 (1919).

ARBOR glauca, mediocris Mallee similis, Morrel vel Blackbutt nominata; cortice laeve, trunci basi lamellis crassis nigris; ligno rubro duro; foliis teneribus sessilibus vel fere sessilibus, lato-lanceolatis vel fere ovatis; foliis maturis petiolatis, lanceolatis, acuminatis, plerumque circiter 10 cm. longis et 2 cm. latis, vena peripherica a margine distincte remota; pedunculis teretibus vel subangularibus 3-9 flores pluvse minusve pedicellatos ferentibus; alabastris operculis elongatis (subconstrictis praecipue siccantibus calycis tubo circiter bis aequilongis; filamentis subflavis; fructibus urceolatis vel sub-globois, circiter 8 mm. diametro, valvorum apicibus subulatis exsertis.

Looked upon as the glaucous or Eastern Gold-fields form of the "Morrel" (*E. longicornis*). Shares the name "Blackbutt" with other Western Australian trees. A medium-sized tree, say 1 foot in diameter (but it may be much smaller, like a Mallee), a White Gum with blotched bark and more or less short flaky ribbons on the trunk, with a little of the roughness at the butt. Colour of timber rich reddish brown and very tough. A felled tree shows long tough splinters.

Juvenile leaves glaucous, sessile or very nearly so, broadly lanceolate to nearly ovate, say 4 cm. broad by 6 cm. long, secondary veins irregularly pinnate, intramarginal vein distinctly removed from the edge.

Mature leaves glaucous, petiolate, lanceolate, acuminate, commonly about 10 cm. (4 inches) long and about 2 cm. at greatest width, covered with fine dots, secondary veins not very distinct, penni-veined, making an angle of about 45 degrees with the distinct midrib, intramarginal vein distinctly removed from the edge.

Peduncles terete or slightly angular, each with three to nine, more or less, pedicellate flowers.

Buds with elongated opercula about twice as long as the calyx-tube, and which are somewhat constricted, particularly on drying. The calyx-tube sometimes of a lesser diameter than the base of the operculum, particularly on drying.

Flowers with yellowish filaments, the stamens inflected in the bud, anthers broad, thick, white, the slits slightly oblique.

Fruits urceolate to subglobose, about 8 mm. in diameter, truncate, a little contracted at the orifice, the rim flat or concave, the capsule sunk, but the slender points of the valves protruding.

The type is from Kalgoorlie, W.A., J. H. Maiden. September, 1909, in National Herbarium of New South Wales, and it is abundantly figured at Part XV, Plate 66. The type is shown at figures 8a-d.

Mr. C. E. Lane-Poole, Conservator of Forests of Western Australia, informs us that it bears the name of "Red-wood," but the name is not useful for various reasons. At the same time, vernaculars are difficult and sometimes impossible to control.

SYNONYMS.

1. *E. uncinata* Turcz., var. *rostrata* Benth.
2. *E. oleosa* F.v.M., var. *glauca* Maiden.

1. See B.Fl. iii, 216. In the present work (Part XIV, 144) I have referred to Drummond's 5th coll. No. 186, which Bentham calls *E. uncinata* Turcz., var. *rostrata* Benth.

A plant with an acuminate or rostrate operculum (though differently shaped) is figured at 14a-c, Plate 62, but it is not the same as Drummond's plant. It is a form of *E. uncinata*.

2. In *Journ. W.A. Nat. Hist. Soc.*, iii, 171 (1911). See also this work, Part XV, p. 167.

RANGE.

We have so long been accustomed to find this species under *E. oleosa*, that it will be some little time before its range is understood. It has a very wide range in the drier parts of the continent. Thus it is widely diffused in Western Australia, South Australia, and the Northern Territory, and is found, probably not widely, in the Mallee country of Victoria. Many of the New South Wales localities, hitherto attributed to *E. oleosa*, belong to this new species.

Western Australia.—In Part XV, p. 172, of this work, will be found a large number of localities, enumerated under *E. oleosa* var. *glauca*, but which belong to this species. All the specimens referred to under page 169 of Part XV (as *E. oleosa*), from the words "At page 124," to the end of the page (169), and coming from the Murchison district, belong to *E. transcontinentalis*. The following are new.

Two specimens collected by R. Helms in the Elder Exploring Expedition.

(a) Dépôt Hill (1,500 feet), 70 miles north-west of Fraser Range, Camp 76, 10th November, 1891. "We crossed a high stony range covered with big Mallee and Gums" (Official Report). This is recorded in *Proc. Roy. Soc. S.A.*, xvi, 357, as *E. oleosa*.

(b) No. 26a, Camp 56, Victoria desert, 19th September, 1891. "On this day sand-hills were met with, and also Mallee. On the previous day Desert Gums (? *E. eudesmioides*) and five kinds of Mallee were found." (Official Report.) Recorded in *Proc. Roy. Soc. S.A.*, xvi, 358, as *E. incrassata*.

Comet Vale, 70 miles north of Kalgoorlie (J.H.M.). 70 miles north of Kurrawang, on the Wood-line (J.H.M.). These two localities are only a few miles apart.

Kalgoorlie (C. H. Ostenfeld, Nos. 514, 521).

Bulla Bulling, 42 miles west of Kalgoorlie (Dr. F. Stoward, No. 87). Bruce Rock-Merriden district (Dr. F. Stoward, No. 14).

Northern Territory.—241a. 35 miles north-west of Meyer's Hill. 2nd June, 1911. Broadish leaves and fruit. One small specimen.

117. Hugh River. 21st March, 1911. Stunted scrub on stony ridges. Stem covered with long flakes of smooth bark. New bark brown colour.

Both specimens have leaves broader than the type, especially No. 241a, and hence show a transition to *E. Gillii* Maiden. (In Ewart and Davies' "Flora of the Northern Territory," p. 305.)

Gosse's Range, Central Australia (Revs. Schwarz and Schulze ex herb. Melb.), under *E. oleosa* in Part XV, p. 171.

South Australia.—The following specimens referred to under page 170 of Part XV (as *E. oleosa*) belong to *E. transcontinentalis*. Port Lincoln (in part), Murray Scrub, Murray Bridge, Tintinnarra, Flinders Range, also near Quorn, Mt. Remarkable and Crystal Brook, Roseworthy, Venus Harbour, Water Mallee (Ooldea).

At Part XV, p. 173 (under *E. oleosa* var. *glauca*) only Ooldea is recorded. This specimen, by the way, was received as "Water Mallee," meaning that it is a species from which the aborigines extract water from the roots.

Following are localities additional to those already enumerated.

"Called 'Sand-hill Mallee,' as it is only to be found on the sand-hills of the district. It does not, however, occupy the extreme top of the sand-ridges, which position is always occupied by *E. incrassata* var. *angulosa*." Minnipa, Eyre's Peninsula (W. J. Spafford, No. 16). Port Lincoln (W. Gill).

Flinders Range (Max Koch No. 570). A Mallee, or a low stunted-looking tree, Flinders Range, near Quorn (Max Koch, No. 532). Mount Remarkable, Flinders Range (W. Gill).

"Clean-branched Mallee." Monarto South (Dr. J. B. Cleland). River Murray, 12 miles east of Morgan (Dr. J. B. Cleland, Nos. 1 and 17). "Rough bark all the way up." Timber of this. River Murray, chiefly 15 miles east of Morgan (Dr. J. B. Cleland, No. 27).

Victoria.—In the localities for *E. oleosa*, enumerated in Part XV, p. 171, it is associated at Nyaah and Bumbang with *E. transcontinentalis*. This is in the Mallee or north-west part of the State, which should be further searched for this species.

New South Wales.—The following localities for *E. oleosa*, enumerated at Part XV, p. 171, belong to *E. transcontinentalis*. Lower Lachlan River, Coolabah and Girilambone, Cobar and Wittagoona, Mount Boppy (the last interspersed with *E. oleosa*).

To these may be added the following specimens from Mr. W. D. Campbell, L.S., from the Narrandera district. The same gentleman forwarded *E. oleosa* from the same localities, see p. 277.

- A. "Grows into a stunted tree, *i.e.*, a Mallee getting large." N.W. side of Lake View basin, 15 miles from Griffith.

B. Bellandry Estate (No. 4).

C. Line 9900, Griffith.

D. North of Lake View, east of crossing of N. boundary, lot 52, with C.S. 35, Bellandry.

"A small tree of 12-30 feet. It is usually a Mallee, with numerous stems issuing from a common stock, each stem being pretty uniform in size and height. It has rather a large or long leaf, making it appear conspicuous amongst the other Mallees. Locally known as "Large Mallee." Grows in gravelly places. Bark long-fibrous, breaking away in long flakes, leaving the inner bark of a pale yellow glaucous colour. Tips of branches pale deep brown. Cobar (J. L. Boorman, May, 1918).

AFFINITIES.

1 and 2. *E. oleosa* F.v.M. and *E. longicornis* F.v.M. Its closest relations are with these two species. See p. 280.

3. With *E. falcata* Turcz., and particularly var. *ecostata* Maiden.

If we turn to Plate 68, Part XV, we shall find undoubted relations between the two species. The juvenile leaves of *E. falcata* are more glaucous, broader, less acuminate and more petiolate. The calyx tube is more ribbed (even in var. *ecostata*), the fruits ribbed, more pear-shaped and more constricted at the mouth.

4. With *E. Gillii* Maiden, var. *petiolaris* Maiden, in *Journ. Roy. Soc. N.S.W.*, liii, 69 (1919).

See Plate 67, figs. 3a, 3b, and 4a, 4b, with Plate 66, figs. 8a-d (*E. transcontinentalis*). Both forms are glaucous, but their mature leaves (and indeed their juvenile leaves) are very different. Their buds are not very dissimilar. The fruits of *E. transcontinentalis* are more urceolate and with more protruded valves.

DESCRIPTION.

CCXI. *E. longicornis* F.v.M.

In *Fragmenta* xi, 14 (1878).

FOLLOWING is a translation of the unsatisfactory original description:—

E. oleosa var. *longicornis* (*E. longicornis* F.M. coll.), includes a tree well known in Western Australia under the name of "Morrel." It attains a height of 120 feet, and has a rugose ash-coloured bark (Rhytiphoiæ) on the trunk, persisting to the branches. It grows interspersed amongst *E. loxophleba* (*foecunda*) and *E. salmonophloia*, showing affinity in bark to the former and in foliage to the latter. It is nearest to *E. oleosa*, and may perhaps be a variety of it, but it differs in the size of the tree, in the lustre and length of the leaves, the greater length of the peduncles and pedicels and in the elongated operculum. The characters which separate it from *E. salmonophloia* are the persistent bark, the operculum, longer and more acute, the slender style and the distinctly larger fruits. (*Fragm.* xi, 14, 1878.)

In his "Forest Resources of Western Australia" (1879), Mueller figures *E. longicornis*, but at p. 12, in referring to *Fragm.* xi, 14, says:—

It is needless to devote to this Eucalypt a special description, as most probably it constitutes a mere variety of the preceding (*E. oleosa*). It differs, however, in its comparatively tall stature, attaining a height of 120 feet, and perhaps more.

And he repeats the differences from *E. fœcunda* and *E. salmonophloia*, already given.

In "Eucalyptographia," under *E. oleosa*, Mueller says:—

In Western Australia occur several kinds of trees, the precise relation of which to *E. oleosa* is not yet clearly understood; they are the Morrell, *E. longicornis* (he adds *salmonophloia*, *salubris*, *leptocœda* and *decipiens*). . . . All attain a height of about 100 feet [*E. leptopoda* certainly does not, and I have my doubts as to some of the others.—J.H.M.] and *E. longicornis* may only be the favourably developed arboreous state of *E. oleosa*; its bark is totally persistent, the foliage is like that of *E. salmonophloia*, the lids are horn-like, elongated, which suggested the name, and outer stamens are straight in bud.

So far as I know, this is the last statement Mueller made in regard to *E. longicornis*, and he omitted the name from his Census.

Illustrations.—In this work, Part XV, p. 166, and at figs. 4a and 4b and 5, Plate 66, and figs. 1a to 1e, 2, Plate 67, I have referred to and figured this tree, and have suggested the identity of this particular Morrel with the Poot, also of Western Australia.

I am now of opinion that Mueller's *E. longicornis* is sufficiently distinct from *E. oleosa* to be considered a species, and therefore I recommend adoption of the name. The species has been sufficiently characterised, although Mueller did not describe it as formally as he would have done had he been more certain of it. The size, the bark, the timber and other botanical points show sufficient differences. The above note will be found in a paper by me in *Journ. Roy. Soc. N.S.W.*, lii, 504 (1918).

We know the tree that Mueller dealt with in this step-motherly fashion, but he never described it in a way it would be considered necessary at the present day. This omission may now be supplied.

A tall tree with "a rugose ash-coloured bark (*Rhytiphloia*) on the trunk, persisting to the branches." Timber red, very tough. The tree bears the name of "Morrel." To a less extent it goes under the name of "Poot." The bark is further described in Part XV, p. 166.

Juvenile leaves glaucous, lanceolate to broadly lanceolate, secondary veins spreading, the intramarginal vein well removed from the edge, the axis angular. (See figs. 1a, 1b, Plate 67; outlines of leaves, slightly alternate, shown in Plate 13 of Mueller's "Forest Resources of Western Australia.")

Mature leaves narrow lanceolate, acuminate petiolate, lustrous. See Plate 13 aforesaid for leaves and other details.

Peduncles terete or slightly angular, each with three to nine more or less pedicellate flowers.

Buds glabrous, operculum elongated, more than twice as long as the calyx-tube, and continuous with it.

Flowers with cream-coloured filaments, the stamens inflexed in the bud, anthers broad, thick, white, the slits slightly oblique.

Fruits ovoid or globose, the rim flat or concave, the capsule sunk, but the slender points of the valves formed by the split base of the style protruding.

SYNONYM.

E. oleosa F.v.M., var. *longicornis* F.v.M. Fragm. xi, 14 (as already stated).

RANGE.

It is confined to Western Australia so far as we know, and would appear to be most widely diffused in the western part of the State. Northerly it is recorded as far as Carnamah on the Midland Railway, 179 miles from Perth, and southerly as far as Broome Hill, 237 miles to the south. Easterly it occurs in the Kalgoorlie district, but its range requires to be far better defined than appears to have been done at present.

Following are some specimens in the National Herbarium, Sydney :—

Mueller labelled specimens from "Upper Swan River," "Morrel" and "*E. oleosa*, var. *longicornis*." These match his fig. 13 in his "Report on the Forest Resources of Western Australia" exactly (see fig. 4, Plate 66).

Carnamah, Victoria District (Dr. A. Morrison).

Specimens with fruit of a tree with narrow leaves and shorter peduncles and pedicels than the type, from Cowcowing (Max Koch), appear to be referable to this form (see fig. 5, Pl. 66), but they are not normal.

"Morrel," Quairading, H. St. B. More (communicated by O. H. Sargent under his No. 718).

"Morell," 60-90 feet, and up to over 4 feet in diameter, colour of flowers cream. Grows in the eastern district in good soil. Collected near Government dam, Moojebing, near Katanning, Great Southern Railway (Dr. F. Stoward, No. 121).

Broome Hill, Great Southern Railway, "Poot" (Dr. A. Morrison, Louis Dillon, J.H.M.).

Coolgardie (L. G. Webster). Buds figured at fig. 2, Plate 67. Coolgardie (E. Pritzel, No. 716), referred to in Part XV, p. 172, as *E. oleosa* var. *glauca*.

Mount Hunt, near Kalgoorlie (Dr. A. Morrison).

Most of the above specimens are referred to in Part XV, p. 171. No. 5454, L. Diels, is *E. Dundasi* Maiden, see Part XXXIII.

AFFINITIES.

The species to which *E. longicornis* are most closely related are *E. oleosa* and *E. transcontinentalis*. See under the former species, at p. 280.

1. With *E. oleosa* F.v.M.

"*E. longicornis* may only be the favourably developed arboreous state of *E. oleosa*." ("Eucalyptographia," under *E. oleosa*.) This will be further dealt with in a tabular form, at p. 280.

2. With *E. salmonophloia* F.v.M.

"The characters that separate it from *E. salmonophloia* are the persistent bark, the operculum, longer and more acute, the slender style, and the distinctly larger fruits." (Original description.) If we turn to Plate 73 (Part XVII) for *E. salmonophloia*, we may compare it with Plate 66 (Part XV) for *E. transcontinentalis*. The two species differ in most points, although there are undoubted affinities between *E. salmonophloia* and the *oleosa* group.

DESCRIPTION.

LXXIII. *E. oleosa* F.v.M.

Miq. in *Ned. Kruidk. Arch.* iv, 128 (1856).

THIS is another species where improved knowledge has shown that accumulations have gathered round the original description, and require to be pruned away. In the present case, the development of the seedlings has been of the very greatest assistance, and I trust that, in this work, I may be able ere long to publish the interesting results of over twenty years of continuous observations in this direction.

The revision of an old species is somewhat analogous to building a house. If one has an indubitably new species, the work is plain—new plan, new bricks, and so on. But where a species has to be reconstructed, or rather, where additions must be removed which have become more or less incorporated in the old structure, the fresh plan for two or more houses to be built out of the enlarged old one necessitates the pulling down, more or less, of the original structure, removal of the additions which have been wrongly placed in and outside the fabric, and the replacement of these, perhaps, with other materials. Call these additions bricks, and one is reminded of the saying of an architect or a builder, that it is often easier to build a new house from new materials, than to reconstruct.

Following is a translation of the original description, quoted in Part IX, p. 165, where I give the warning that it refers to mixed material, and give some notes on the synonymy.

E. oleosa F. Müll., *E. perforata* Behr Herb., partly. Has affinity with *E. stricta* Sieb. Marble Range (Wilhelmi); Murray Scrub (Dr. Behr).

A shrub, branchlets angular, leaves narrow lanceolate or sublinear, extending into a hooked point, everywhere finely sphacelate (?), narrowed at the base, mostly inaequilateral, coriaceous, covered thickly with shining glands, veins somewhat obscure, erect and spreading, umbels axillary, 4–10 flowered, supported by an angular peduncle, flowers shortly pedicellate or subsessile, operculum conical-hemispherical, somewhat obtuse, about the same length as the obconical-turbinate tube.

“A shrub as high as a man, branches and leaves a cheerful shining green” (Behr). Branchlets angular, pale whitish, or when younger, deep brownish. Petioles 3–4 lines long, somewhat yellowish when dry. Leaves $1\frac{1}{2}$ – $2\frac{1}{2}$ generally about 2 inches long, 2–3 lines broad, straight or oblique. Peduncles scarcely 2 lines long. Calyx $1\frac{1}{2}$ lines long, often somewhat longer than the operculum, pale. Filaments pale. (Miq. in *Ned. Kruidk. Arch.* iv, 128, 1856.)

Illustrations.—This species need not be illustrated at this place, since the following illustrations in the present work are available. Plate 65, figs. 2a, 2b; 6a, 6b; 4f, 4g, 4h; 7a, 7b; 8a, 8b; 9; 10a, 10b, 10c; 11a, 11b; 12a to g; together with Plate 19 (Part IV), fig. 5.

In Mueller's "Eucalyptographia," in the Plate of *E. oleosa*, the twig to the left is that species, while the main figure is *E. transcontinentalis*.

In my "Forest Flora of New South Wales," Part LX, Plate 226, of *E. oleosa*, fig. D is *E. oleosa*, while the rest of the Plate is *E. transcontinentalis*, with the possible exception of fig. E, which was drawn from unipe fruits.

RANGE.

The "type" is said to have come from Marble Range (Wilhelmi) and Murray Scrub (Dr. Behr), both in South Australia; see Part XV, p. 165. It is obvious, therefore, that we have no type in the modern sense, which should come from one locality, and if possible from one tree. Even where specimens purporting to be the type come from the same clump of trees, the pitfalls are and were great, particularly to the pioneer collectors and botanists. In the present day the species is defined (or should be) with such precision that there is no uncertainty as to the plant the original describer has before him. In the present case, we know that Wilhelmi, who resided near Port Lincoln, collected westerly to the Marble Range (about 30 miles distant), while Behr collected near the banks of the Murray, in South Australian territory.

Besides that State, it is also found in the States of Western Australia, Victoria, and New South Wales.

Western Australia.—Of the specimens enumerated in Part XV, p. 169, the following appear to be *E. oleosa*; Pindar, Ravensthorpe, Eucla. Goongahie, 65 miles north of Kalgoorlie (J.H.M.) may be added.

[The Comet Vale specimen (figs. 13a, 13b, Plate 65) is a slightly aberrant form of *E. transcontinentalis*, admixed with the normal form of that species: see figs. 9a, 9b, Plate 66. All the specimens referred to from the words "At page 124" to the end of the page (169 aforesaid), belong to *E. transcontinentalis*.]

The *E. oleosa* localities are a mixture of interior and coastal ones, but it must be borne in mind that in the Great Australian Bight the rainfall is comparatively low, like that over wide inland areas. Thus we have it from nearly as far north as the Murchison district, and also in the Kalgoorlie district, and probably it will be found in intermediate localities. Ravensthorpe and Eucla show that it occurs at or near the south coast.

South Australia.—Of the specimens enumerated in Part XV, p. 170, the following appear to belong to *E. oleosa*. Port Lincoln (including Point Kirton), Parilla, Mannum, type of *E. socialis*, Dublin Scrub, Nackara Forest, Cape Jervis, Murat and Denial Bays, Fowler's Bay, Streaky Bay, Robert Brown's Bay iii, Peeneri Mallee, Ooldea, type of *E. turbinata* (p. 171).

[The following specimens, referred to on the same page, belong to *E. transcontinentalis* :—Port Lincoln (in part), Murray Scrub, Murray Bridge, Tintinnaria, Flinders Range, Roseworthy, Crystal Brook, Water Mallee from Ooldea.]

The following specimens are inland, and are arranged going northerly :—

Small shrub, 1–2 metres (3 feet 3 inches—6 feet 6 inches) high, locally called “Green Mallee.” Pinnaroo (Tailem Bend and Pinnaroo Line, 162 miles from Adelaide). (J. M. Black, No. 3.)

Alawoona (Tailem Bend and Paringa Line, 152 miles from Adelaide). (Dr. J. B. Cleland, Nos. 10 and 21.)

“Smooth-barked Mallee,” 10 miles west of Mannum. (Dr. J. B. Cleland.)

The following are additional specimens from Eyre’s Peninsula :—

“Red Mallee.” Timber reddish-brown, from a stem 6 inches in diameter; bark rough, fibrous, peppermint-like. Sucker leaves lanceolate glaucous, opercula blunt conical. Minnipa, 157 miles, a little to the west of north of Port Lincoln. (W. J. Spafford, No. 12.)

Mt. Weedind, a granite outcrop about 15 miles south from the Gawler Ranges, and 125 miles a little west of north from Port Lincoln (W. Gill).

The coastal localities, Fowler’s Bay, &c., connect with the Western Australian ones, while those of Eyre’s Peninsula, the Flinders Range, and those of eastern South Australia, particularly those approaching the Murray, naturally connect up with the Victorian and New South Wales localities.

Victoria.—In Part XV, p. 171, all the Victorian specimens attributed to *E. oleosa* belong to that species, but in the Nyaah and Bumbang localities, *E. transcontinentalis* also occurs. These are in the Mallee or north-western district of Victoria, and connect with the eastern South Australian specimens on the one side, and with the New South Wales ones on the other.

New South Wales.—The following specimens recorded as *E. oleosa* in Part XV, p. 171, belong to that species—Abbott’s Tank, Condobolin, Wyalong; Mt. Boppy (with *E. transcontinentalis*).

To these the following specimens collected by Mr. W. D. Campbell, L.S., from the Griffith district, near Narrandera, may be referred :—

- a. “Giant Mallee,” Line 7200, Parish Kooba, County of Cooper.
- b. “Giant Mallee.” At fence near Line 99, Griffith (County of Cooper).
- c. Ballandry Estate, West Boundary fence (No. 41), at 3600 U. (County of Cooper).
- d. “Mallee,” Line 9900, N. of Lake View, Parish Kooba, County of Start (west of the three preceding localities).

So that the New South Wales localities going north from the Murray are Balranald, Condobolin, Mt. Boppy (the furthest north), then turn south to Wyalong and Narrandera. These localities indicate that the species will be probably found to occur very extensively in the western and south-western plains of the State.

VARIETY.

angustifolia var. nov.

Synonym, *E. socialis* F.v.M. in Miq. *Ned. Kruidk. Arch.* iv, 132, 1856 (see Part XV, p. 167, of the present work), but excluding Mueller's variety *latifolia*—*E. laurifolia* Behr (see p. 177).

The type, consisting only of mature leaves and flowers (so far as I have seen specimens), but described from ampler material, is figured at figs. 17*a*, 17*b*, Plate 65. Probably the following illustrated specimens belong to this form—figs. 18*a*, 18*b*, 18*c*, Plate 65; figs. 1*a*, 1*b*, 1*c*, Plate 66; and possibly figs. 2*a*, 2*b*, 2*c*; 3*a*, 3*b*, Plate 66. I have not been successful in obtaining seeds of this form, but hazard the suggestion that, when obtained, they will be narrow (in contrast to those of *E. oleosa*, which are broadish in the type though variable), and thus *E. socialis* of Mueller may become justified.

RANGE.

South Australia.—A reputed type specimen from Mueller (fig. 17, Plate 65) came from "Towards River Murray," but (p. 167, Plate XV) some of the type described came from "Pine Forest, near Gawler Town," and frequently beyond Salt Creek. But as the description includes *E. laurifolia* Behr, which belongs to a different species, being a petiolate form of *E. Gillii* showing transit to *E. oleosa* (see Part XV, p. 177 and fig. 3*a*, Plate 67), the type locality of *E. socialis* is not perfectly clear.

Dublin Scrub (fig. 18, Plate 65) is certainly towards the Murray, while Swan Hill, Victoria (fig. 1, Plate 66), with more rounded opercula, is likewise on the Murray.

Western Australia.—The specimens at figs. 2 and 3 (Plate 66) are from Western Australia, west of that State, the Murchison being considerably north of Perth. But, as has been already indicated, these specimens require further investigation.

AFFINITIES.

In the original description Mueller gives *E. perforata* Behr as a synonym "ex parte." Reference to Part III, p. 81, shows that *E. perforata* is also a synonym of *E. gracilis* F.v.M., of *E. odorata* Behr, Part XI, p. 30; of *E. uncinata* Turcz., Part XIV, p. 144. See also Part XV, p. 168. So it may be dismissed. The other species quoted, "*E. stricta* Sieb., affinis" is a New South Wales one belonging to the *Renantheræ*, and modern inquiry has shown that the two species are not nearly related. As regards other species quoted by Mueller in his subsequent researches into the affinities of *E. oleosa*, I have dealt with them at Part XV, pp. 173 to 175.

The true affinities of *E. oleosa* are with *E. falcata* Turcz. (see Part XV, p. 175), and also with *E. longicornis* F.v.M. and *E. transcontinentalis* Maiden, both included in it by Mueller, and now carved out of it.

The affinities of *E. oleosa* and its two closest relations, *E. longicornis* and *E. transcontinentalis*, will be stated presently.

I have (p. 275) already referred to the fact that Mueller, in his original description, described *E. oleosa* from mixed material. Bentham (B.Fl. iii, 248), draws attention to the fact that his description is only partly taken from Mueller's revised one in *Fragm.* ii, 56. The Western Australian specimens, "as well as a few of those from the Murray Desert," which are "distinguished by the long beak to the operculum," probably belong to *E. transcontinentalis* and some (Moir's Inlet) to *E. longicornis*.

I have shown (p. 272) that Mueller included *E. longicornis* under *E. oleosa*.

The following localities (there are doubtless others) produce *E. oleosa* and *E. transcontinentalis*, and that the two species have been confused, at least from the following localities, by botanists and collectors who have given special attention to the genus, is testimony to their close affinity.

Western Australia.—70 miles north-west of Fraser Range.

South Australia.—Port Lincoln (including Point Kirton), Pinnaroo, Murray Scrub.

Victoria.—Nyaah, Bumbang.

New South Wales.—Mt. Boppy, Narrandera-Griffith district.

	<i>E. oleosa.</i>	<i>E. transcontinentalis.</i>	<i>E. longicornis.</i>
Seedlings ...	Shortly petiolate or sessile, not long, lanceolate or narrow-lanceolate leaves preponderate. Heath-like (<i>longicornis</i>) leaves not rare. The leaves of <i>E. oleosa</i> are intermediate between those of <i>E. longicornis</i> and <i>E. transcontinentalis</i> .	Glaucous, shortly petiolate, long, Oleander-like leaves preponderate. Second growth leaves may display considerable resemblance to those of <i>E. oleosa</i> .	Heath (<i>Erica</i>)-like leaves preponderate.
Sucker leaves	Narrow to broad oblong-lanceolate; also broad-lanceolate, from nearly sessile to distinctly petiolate; glaucous.	In the typical form (fig. 8a, Plate 66) the juvenile leaves are sessile, but as growth proceeds they become petiolate. The differences in shape may be considerable, varying, with all degrees of transition, from the broad lanceolate of the type to lanceolate and even ovate. Indeed the collection of sucker-leaves is often best the work of the skilled collector.	Lanceolate to broadly-lanceolate or oblong, the intramarginal vein very much removed from the edge; sessile or nearly so.
Mature leaves	Lustrous, sometimes narrow and short.	Glaucous or dull, and rather coarse.	Lustrous, often thin and long.
Flower buds ...	Opercula "conical-hemispherical, somewhat obtuse, about the same length as the calyx-tube." Filaments "pale."	Operculum elongated, about twice as long as the calyx-tube, somewhat constricted, particularly on drying. Operculum often of greater diameter than the calyx-tube. Buds larger than those of the other species. Filaments sulphur-yellow.	With long pedicels and peduncles, the operculum acute, more than twice as long as the calyx-tube, and continuous with it. Operculum often of less diameter than the calyx-tube. Filaments cream-coloured.
Fruits... ...	A good deal of similarity in the three species. Those of <i>E. oleosa</i> the smallest. All vary from pear-shaped to subglobose and slightly urceolate.	The largest fruits, and most urceolate; glaucous.	More pear-shaped than the others.
Size	A shrub.	Medium-sized tree, but sometimes a shrub.	Very large tree,

DESCRIPTION.

CCXII. *E. Flocktoniæ* Maiden.

In *Journ. Roy. Soc. N.S.W.* xlix, 316 (1915).

THIS species is described as fully as the material available enables us to do, in Part XVI, p. 185, of the present work. The description is backed up by figs. 1-3 of Plate 69.

The seedlings of *E. Flocktoniæ* are remarkable, and may thus be described from the earliest stages. Hypocotyl long, wiry and angular, crimson. Cotyledons bisected, green on the back, with sometimes a purple tip. Stem angular, crimson, with prominent oil-glands. First leaves narrow-linear, *alternate*. They afterwards become opposite. As development proceeds, and while the leaves are opposite, they become decurrent in a remarkable degree. (J.H.M. in *Proc. Roy. Soc. N.S.W.*, xlix, 317.)

SYNONYM.

E. oleosa F.v.M. var. *Flocktoniæ* Maiden in *Journ. W.A. Nat. Hist. Soc.* iii, 172 (1911); also Part XVI, p. 185, of the present work (var. *Flocktoni* by a slip of the pen).

RANGE.

So far as is known at present, it is confined to southern parts of Western Australia, from the vicinity of Broome Hill easterly to Esperance, in inland and perhaps coastal situations.

Esperance (Lindley L. Cowen). Desmond, near Ravensthorpe (J.H.M.).

Growangerup, 30 miles east of Broome Hill, Great Southern Railway (W. C. Grasby).

AFFINITIES.

These are discussed at some length at Part XVI, pp. 185, 186.

1. With *E. Cooperiana* F.v.M.

Only leaves and flowers (with buds) of *E. Cooperiana* are in existence (see fig. 5, Plate 151, Part XXXVI); fruits were never seen by Mueller, and therefore one must proceed with caution. Some not perfectly ripe fruits (which perhaps belong to *E. Flocktonia*) have since been attributed to *E. Cooperiana*, but they are, I think, not free from doubt. I hope, therefore, that the publication of the figures (and of the present statement) will set collectors to work, and material will be rendered available to decide what *E. Cooperiana* really is. It is near to *E. Flocktonia*, from which it differs in the broad peduncles and pedicels, the broader leaves and the operculum, which is long in *E. Flocktonia*. At the same time, *E. Cooperiana*, and to a less degree *E. Flocktonia*, are species which require further investigation.

Although Mueller said he had not seen *E. Cooperiana* in fruit, I have received from Prof. Ewart a small twig bearing two not fully developed fruits, which certainly bear some general resemblance to those of *E. Flocktonia*. (This work, Part XXXVI, p. 167.)

2. With *E. salmonophloia* F.v.M.

"Its affinities in this respect (seedlings) are with *E. salmonophloia*, the young leaves of which are, however, glaucous." (J.H.M. in *Proc. Roy. Soc. N.S.W.*, xlix, 317, 1915.)

3. With *E. Gillii* Maiden.

"It resembles *E. Gillii* in the early stages (seedlings), but the leaves do not then become decurrent." (J.H.M., *ib.*)

DESCRIPTION.

XXVIII. *E. virgata* Sieber.

In Sprengel's *Cur. Post.* 195 (1827).

THE original description and the *Prodromus* amplification are set out at Part IX, p. 275, of the present work.

G. Don ("Dichlamydeous Plants," ii, 818) translated the original description as follows:—

E. virgata (Sieb. *pl. exsicc. nov. holl.* No. 467), lid of calyx conical, length of the cupula (calyx-tube); peduncles axillary and lateral, hardly longer than the petioles, and arc 2-edged, as well as the pedicels; leaves oblong-linear, acuminate at both ends, thickish, coriaceous and nearly veinless. Native of New Holland. Leaves 4-6 inches long and about 6-9 lines broad. Twiggy Eucalyptus Tree.

Then Bentham, in B.Fl. iii, 202 (1866), compiled a new description of *E. virgata*, speaking of it as "A tree of considerable size, with a furrowed persistent fibrous bark." (Oldfield). He also, *inter alia*, adds a description of the fruit for the first time, "Narrow pear-shaped," with other details of the fruit. (Sieber did not collect the fruit.)

Let us now examine the material he attributed to *E. virgata*. I find that it consists of three species, viz. :—

1. Sieber's No. 467, which, says Bentham, came from "Port Jackson or Blue Mountains." This is *E. virgata* Sieb., and it came from Port Jackson or its vicinity.

2. The remainder of the New South Wales specimens quoted by him, and also the Victorian ones from Sealer's Cove (the collector should be *Walter*, and not *Walters*). These all belong to *E. Sieberiana* F.v.M., one of the trees called Mountain Ash.

3. The South Australian specimens, which are *E. vitrea* R. T. Baker.

In Spicer's "Handbook of the Plants of Tasmania," p. 149 (1878), we have "*Eucalyptus* sp., Ironbark, George's Bay. (Perhaps identical with *E. virgata* Sieb.)," an erroneous supposition.

Then Mueller ("Eucalyptographia," Decade 2, 1880) describes his *E. Sieberiana* to include Spicer's plant, and gives *E. virgata* as a synonym. Like Bentham he includes three species, and the same three, for his Lake Bonney and other South Australian species are *E. vitrea*, while he takes the "Yowut" or Mountain Ash as his type.

Erroneously assuming that the name *E. virgata* is "very misleading, because only under very exceptional circumstances (he has, as 'exceptional circumstances,' probably the South Australian specimens in his mind's eye) is this usually tall timber tree reduced to a virgate and twiggy state," he took the high-handed step, not unfamiliar to him, of suppressing one properly constituted botanical name and substituting another.

He subsequently, however, considered *E. virgata* to be a synonym of *E. stricta* Sieb., which is not in accordance with fact. See Decade 10, "Eucalyptographia" (1884). *E. virgata* as a specific name was, however, ignored by Mueller until the publication of the Second Census in 1889, in which also *E. stricta* appears.

If we again turn to Decade 10, we find under *E. stricta*, both *E. virgata* and *E. Luehmanniana* F.v.M. appearing as synonyms of *E. stricta*, in the second page of the text, "the variety *Luehmanniana*" of *E. stricta* being referred to in the following passage, "But the real *E. virgata* does undergo a development in another direction, enlarging to that startling state which was distinguished as *E. Luehmanniana*."

In other words, Mueller suppressed *E. virgata* twice, placing it under *E. Sieberiana* and under *E. stricta*. But he brings it forward again in his Second Census, giving only the reference Fragn. xi, 38, which was earlier than that of the "Eucalyptographia," Decade 10, which is the last known comment by him on the synonym.

His *E. Sieberiana* is accepted (as a new combination) because we selectively choose the Mountain Ash as the type. Mueller makes precisely the same number of mistakes as Bentham did, but the latter employed the name *E. virgata*, which we must read *sensu strictu*.

Turning to my remarks on the range of *E. virgata* in Part IX, p. 281, the notes on the three trees may be supplemented as follows. Including the previous specimens I have now perfect suites of all three.

(a), (b) and (c). Messrs. W. F. Blakely and J. L. Boorman visited the spot on 24th August, 1918, and matched the following from the same clumps of plants. Mr. Blakely's words are "Mallee-like shrubs, or sometimes reduced to two stems. Ten to twenty feet high. Timber very hard. Branches almost slate blue; occasionally mottled brown. Young tips conspicuously bright yellow against the glaucous green of the adult foliage."

I again refer to these Spit (Port Jackson) plants at Part IX, 287, under *E. Luehmanniana*, and at Plate 44, figs. 6h, 6k, and at p. 290 again refer to the affinity of *E. virgata* and *E. Luehmanniana*. My additional investigation of these Spit plants has shown that these specimens, attributed to *E. virgata*, are conspecific with *E. Luehmanniana*. My interpretation of *E. virgata* in this work was not wrong; it was too narrow, and should have been extended to include *E. Luehmanniana*.

I believe I have now cleared up a puzzling piece of synonymy, which was rendered more difficult in regard to the critical problem of matching the type, owing to the fact that, in the vicinity of The Spit, *E. virgata* and *E. obtusiflora*, which simulate each other somewhat, were intermixed, but Messrs. Blakely and Boorman have kept the specimens from every individual plant distinct.

E. Luehmanniana F.v.M., Fragm. xi, 38, came from (translation) "sandy-stony tableland about 2,000 feet high, eight English miles towards the north from the Bulli district, very rare among ferruginous gravel. W. Kirton." This is practically the southern part of the National Park, the best known locality for the species.

I have a fragment of the type (leaf and buds only) labelled by Mueller "*Eucalyptus virgata* Sieber, Bulli, W. Kirton." I have compared it with Sieber's No. 467, and can see no difference. I do not doubt that it is typical for *E. Luehmanniana*. Mueller, as the description shows, had ampler material than I have seen. A second specimen, more satisfactory, from the Illawarra, displaying well the characters of *E. Luehmanniana*, is also so labelled by Mueller, and, in addition, *E. virgata* Sieb., by him. The above is largely taken from a paper by me in *Journ. Roy. Soc. N.S.W.*, lii, 510 (1918).

Illustrations.—The following figures of *E. virgata* are extant, and render further figures unnecessary (except photographs, showing habit, which it is my intention to submit in a later portion of the present work). In the meantime, a photo. of *E. Luehmanniana* (*E. virgata*), National Park, in Part XXV of my "Forest Flora," may suffice.

1. Figure 1, Plate 43 of the present work, portion of *E. virgata* Sieb. (the type, being Sieber's No. 467, Fl. Novæ Holl.).

2. Figure 2, Plate 43. Specimens of *E. virgata* from The Spit, Middle Harbour, Port Jackson. In the legend I stated that I have specimens from the locality that quite match the type, but those chosen were to show variation, and to some extent have been misleading. Figure A of Plate 94 of my "Forest Flora of New South Wales" shows a specimen of *E. virgata* in flower from the same spot.

3. Figures 6a-6k of Plate 44. This is labelled *E. Luehmanniana*, but, as stated, all the figures are from National Park, Sydney (practically a type locality of *E. Luehmanniana*), except 6h, 6k, which are from The Spit, Middle Harbour, near Manly, a suburb of Sydney (whence the specimen figured at fig. 2, Plate 43, and labelled *E. virgata*, was obtained).

4. Figures A-G of Plate 98, "Forest Flora of New South Wales," labelled *E. Luehmanniana*, are all from the National Park, and are *E. virgata*.

SYNONYMS.

1. *E. Luehmanniana* F.v.M. (This has been sufficiently explained.)
2. *E. stricta* Sieb., var. *Luehmanniana* F.v.M.
3. *E. virgata* Sieb., var. *Luehmanniana* F.v.M.
4. *E. rigida* Sieb., var. *Luehmanniana* F.v.M.

These three synonyms (Nos. 2-4) are explained at Part IX, p. 288.

The identification of *E. virgata* Sieb. with *E. Luehmanniana* F.v.M. seems quite clear now, but the mistaken keeping of them apart was assisted by the following circumstances. It was not realized in the scrub about Port Jackson (where a good deal of search was made because it was considered to be the home of the type), that it may be glaucous (or only partly so) like *E. Luehmanniana*, some of the patches examined being non-glaucous. Some of the fruits seen were cylindroid, and in other respects different from those of average specimens of the better known *E. Luehmanniana*. The description of *E. virgata* which here follows is made up by slightly amplifying that of *E. Luehmanniana* as given in Part IX, p. 287, of the present work. That of *E. virgata* as given in Part IX, p. 276, is not wrong, but might be more complete.

I may observe that the type specimen of *E. Luehmanniana* F.v.M. (Bulli, W. Kirton), was originally labelled "*Eucalyptus virgata* Sieber" by Mueller himself.

It may be redescribed in the following words:—

A Mallee-like, tall shrub or small tree, rarely exceeding a height of 15 to 20 feet, or a stem-diameter of 3 inches. Sometimes it is single stemmed. The stem smooth and the timber pale-coloured (pale brown).

This species is glaucous, even nearly white. At the same time it imperceptibly passes into a non-glaucous form. The branchlets are angular, and the species is coarse—peduncles, fruits, leaves, &c., being alike large. Young shoots and petioles yellowish.

Juvenile leaves.—Coarse, up to 7 inches long by 4 inches wide. The resemblance to those of *E. Sieberiana* is striking.

Mature leaves.—Glaucous, distinctly falcate, up to 8 inches by $1\frac{1}{2}$ inches. Coriaceous; edges thickened; marginal vein usually at a little distance from the edge.

Peduncles.—Very much flattened. I have specimens which spread out upwards, so much that they are $\frac{1}{2}$ -inch wide at the place of attachment of the inflorescence. Top of peduncle quite broad and fleshy, in which the pedicels are articulate.

Buds.—Angular, pointed.

Calyx-tube.—The calyx often tapers into a widely expanded lobe, which is articulate on a broad-topped common peduncle; usually seven flowers in a head.

Operculum.—Double operculum or large calyptra-like bracts enveloping the whole head of flower-buds, and only thrown off when the individual flower-buds are nearly ready to throw off their own opercula.

Fruit.—Often pale brownish and glossy, subcylindrical, 5-celled, corrugated, partly due to drying (but also corrugated in a green state); the rim slightly projecting.

The history of the present species affords an excellent instance of the advantage of publishing figures and all available data in regard to a doubtful species. It has set my friends and myself to work, and the result is summarised in the present Part.

RANGE.

The species is restricted, so far as is known at present, to New South Wales, in the neighbourhood of the Hawkesbury River, Port Jackson, and the National Park (a few miles to the south). The most northerly locality known to me is the Penang Range, near Woy Woy, Gosford district.

South of Port Jackson.—Following are specimens seen by Mueller.

Bulli (W. Kirton). Two specimens labelled by Mueller (a) "*E. virgata* Sieber. Identical with an original specimen of Sieber's in Sonder's herbarium (in bud only)." (b) "*E. virgata* var. *Luehmanniana*."

There is a third specimen in the Melbourne Herbarium from Illawarra, labelled "*Eucalyptus Luehmanniana* F.v.M. (*E. stricta* var. (?)); *E. virgata* Sieber."

Specimen (a) could not have been obtained from the township of Bulli, but probably a little to the north, on the high land in the direction of what was afterwards known as the National Park. Mr. Kirton lived at Bulli.

National Park (many collectors).

North of Port Jackson.—"From the north side of The Spit, about 200 yards from the ferry, on the right-hand side of the zig-zag road. About 15 feet high, slender, and with a smooth bark. Only three or four trees in the clump." (J. H. Camfield.)

"Mallee-like shrubs or sometimes reduced to two stems, 10–20 feet high. Timber very hard. Branches almost slate blue in colour. Young tips conspicuously bright yellow, contrasting with the glaucous green of the adult foliage." The Spit (W. F. Blakely and J. L. Boorman).

Then it has been sent to me from Spit-road, Manly (J. L. Boorman, 7106). The Spit (Dr. J. B. Cleland). Manly (Rev. J. W. Dwyer, No. 367). Spit-Manly road (C. Lindgren, No. 4). But all four specimens were obtained from precisely the same limited locality as visited by Messrs. Camfield, Boorman, Blakely, and myself.

We now ascend Middle Harbour.

Flat Rock, Middle Harbour (R. Helms, No. 95). "Small tree, 15 feet high, 3 inches thick, smooth bark." North side of Suspension Bridge, Middle Harbour (J. H. Camfield).

One and a-half miles north-east of Killara (R. H. Cambage, No. 4262). St. Ives Creek, $1\frac{1}{2}$ miles north-west of the school (D. Shiress, H. Bott and W. F. Blakely).

Tumble-down Dick, Pittwater-Gordon road, about 5 miles from Narrabeen. A fairly large patch, between 20-30 acres in extent on the south side of the hill, of dense whip-stick Mallee growth, with an average height of about 12 feet and 1-3 inches in diameter, associated with *E. hamastoma* and a dwarf form of *E. eugenoides*. On the top of the hill is mostly *E. Sieberiana* and a few stray plants of *E. punctata*, *E. piperita*, and *E. corymbosa*. (W. F. Blakely and D. W. C. Shiress, 1/6/19.)

"I have also noticed that it grows in the vicinity of permanent fresh water. There is a patch of this species about $2\frac{1}{2}$ miles from the Mout Colah gates of the Chase, nearly opposite the head of the salt water in Cockle Creek." (W. F. Blakely.)

Track to Gibberyong Creek, 2 miles east of Hornsby, near Kuring-gai Chase boundary line (W. F. Blakely). Berowra (R. H. Cambage and J.H.M.). "Small Mallee-like plants, growing in clusters or clumps on tops of hills." Near Berowra Station, south-east side (W. F. Blakely). Kuring-gai Chase, on hill opposite house-boat, east side of Cowan Creek (W. F. Blakely).

Here comes the Hawkesbury River.

There is about an acre of it (in a long strip) at the Kariong Trig. Station (807 feet), a continuation of the Penang Range, about 4 miles west of Woy Woy, and north of the Hawkesbury River about 8 miles. The shrubs are about 12 feet high, with stems of 2 to 3 inches in diameter. (Andrew Murphy.)

Mr. W. F. Blakely gives me the following interesting account of its distribution in the Kuring-gai Chase:—

"A peculiar feature of this species is its adaptation to the south side of the highest peaks throughout the Kuring-gai Chase. In fact, I have not yet seen it growing in any other position.

"On one occasion, namely at St. Ives, it had descended the hillside to a much lower level than I had previously seen it, but at the same time it was well within its own peculiar environment, namely, on the cold south side of the hill, on a damp rocky slope or ledge. I have never known it to descend from the steep hillside on to the flats below, although the seed cannot escape from being washed down, and if any by chance germinates, plants never seem to thrive. The habit and environment of the plant is suggestive of being, at one time, an inhabitant of cold mountain peaks,"

AFFINITIES.

1. With *E. oreades* R. T. Baker.

This is the close affinity. The two species are so closely allied that they may be properly termed geminate. The matter will be dealt with under *E. oreades*.

2. With *E. Sieberiana* F.v.M.

The confusion of *E. virgata* with *E. Sieberiana*, a "Mountain Ash," with furrowed fibrous bark (often confused with an Ironbark at first sight), has already been dealt with, and largely arises out of the uncertainty that existed for many years as to the identity of *E. virgata*. The juvenile (sucker) leaves of the two species are remarkably similar.

A tentative table as to the relations of *E. oreades* and some allied species is herewith. *E. stricta* Sieb. will be dealt with in Part XL. For a more detailed comparison with *E. oreades* and *E. obtusiflora*, see p. 297.

	Habit.			Juvenile (Sucker) Leaves.	Fruits.	Mature Leaves.	Buds.	Branchlets.
<i>virgata</i> ...	Mallee-like	...	...	Broad-lanceolate; axis conspicuously glandular.	Sub-cylindrical, large, corrugated, rim broad.	Large, coarse, glaucous.	Broad peduncle, buds angular, operculum pointed.	Conspicuously angular; yellowish.
<i>oreades</i> ...	Tree	...	...	do	Similar in shape, but smaller and not corrugated except when unripe.	Smaller	do	do
<i>frazinoides</i>	do	...	...	Lanceolate to broad-lanceolate.	Spherical to ovoid; rim thin (?) Somewhat urceolate.	Largish, falcate	Operculum pointed.	
<i>obtusiflora</i>	Mallee-like	...	...	Narrow-lanceolate to broad-lanceolate.	Truncate ovoid, rarely urceolate; rim thick.	Lanceolate to broad-lanceolate.	Operculum often rugose.	
<i>stricta</i> ...	Mallee-like Occasionally a tree.	a	...	Lanceolate or narrow-lanceolate.	Urceolate-ovoid; rim thin.	Narrow-lanceolate	Operculum very short, nearly hemispherical.	

DESCRIPTION.

CCXIII. *E. oreades* R. T. Baker.

In *Proc. Linn. Soc. N.S.W.* xxiv, 596 (1899), with Plate XLIII, the fruits unripe.

FOLLOWING is the original description :—

A tall tree with a smooth whitish bark down to the ground, or sometimes leaving a lighter rough bark 6-8 feet from the ground.

Young leaves thin, elliptical-oval, shortly acuminate on a petiole of about an inch or more; venation more distinct than on mature leaves. Mature leaves long, often 9 inches, thick, shining, dark green on both sides, on rather long petioles, lanceolate, falcate, venation distinct, intramarginal vein removed from the edge, lateral veins very oblique, often approaching the venation of *E. coriacea* A. Cunn. Oil glands numerous.

Peduncles axillary, not numerous, generally with about 6-8 flowers. Calyx-tube hemispherical on a pedicel of about 2-3 lines. Operculum hemispherical, acuminate, about the size of the calyx. Stamens recurved in the bud; all fertile. Anthers kidney-shaped. Ovary small, flat-topped.

Fruit hemispherical, rarely pyriform, about 3 lines in diameter, the rim thin, capsule sunk, valves rarely or scarcely exerted.

[Has] a light pale-coloured, rather soft timber, fissile and not easily distinguished from that of *E. Sieberiana* F.v.M. ("Mountain Ash"); it should be classified amongst the "Ashes." It is quite a distinct timber from "Blue Gum," *E. saligna*, and it is only suitable for indoor work. As its specific gravity is light and the timber tough, it might be tried as a substitute for English Willow. It is largely used in the sawmills on Mount Victoria, towards Jenolan (R. H. Cambage).

A couple of years previously the tree had been described, and its correct affinity indicated by Messrs. Deane and Maiden in *Proc. Linn. Soc. N.S.W.* xxii, 713 (1897), as *E. Luehmanniana* var. *altior*. The description has been transcribed at Part IX, p. 288, of the present work.

Illustrations.—Besides the original, it is figured at figs. 7a-f, Plate 44, Part IX, of the present work, and H, K, L of Plate 98 of my "Forest Flora of New South Wales," as *E. Luehmanniana* var. *altior*. Buds, fruits and a leaf were figured by Deane and Maiden in *Journ. Linn. Soc. N.S.W.* xxii, fig. 20 (1897), as var. *altior*. The foliage is to all intents and purposes similar to that of *E. virgata* (*Luehmanniana*), but *E. oreades* is usually a large tree, and a photograph of it will be found (as var. *altior*) in Part XXVI (1907) of my "Forest Flora."

At fig. 6a, Plate 44 (repeated at fig. B, Plate 98, of my "Forest Flora of New South Wales") is depicted the juvenile leaves of *E. virgata* (*Luehmanniana*) from the

National Park. The original drawing was endorsed "identical with *E. virgata* var. *altior*, Blackheath, J.H.M., January, 1905," by the artist, in which I concurred, and therefore a separate drawing was not made, in either plate, for the sucker leaves of *E. oreades* (*E. virgata* or *E. Luehmanniana* var. *altior*).

The width of the rim of the fruit is an important character, not brought out in the original figure, but shown in fig. 20 of Plate XXXIII, *bis*, of *Proc. Linn. Soc. N.S.W.*, XXII, by Messrs. Deane and Maiden in 1897, and better still in the Plates 44 and 98 just quoted.

I am of opinion that the tree, a supposed hybrid of *E. stricta*, collected by Mr. Cambage and myself at Blackheath, Blue Mountains, and a photograph of which is shown in Part XXV of my "Forest Flora of New South Wales," is a depauperate form of *E. oreades*. It grows on the thinly covered sandstone rock, and not on the tree-loving deep soil of the taluses or sides of gullies; also, its fruit is not ripe, although riper than that of the type specimens of *E. oreades*. This is cursorily referred to at Part IX, p. 283, of the present work, and the material available is fully described by Mr. Cambage and myself in *Proc. Linn. Soc. N.S.W.*, xxx, p. 199 (1905), under the letter A.

SYNONYMS.

1. *E. Luehmanniana* F.v.M., var. *altior* Deane and Maiden, in *Proc. Linn. Soc. N.S.W.*, xx, 713, 1897.
 2. *E. virgata* Sieb., var. *altior* Deane and Maiden; this work, Part IX, p. 288, 1907.
-

RANGE.

It is confined to New South Wales, so far as we know at present. It is found in the valleys or on the taluses of the hills of the Blue Mountain Range from Springwood higher. It has also been found at Hill Top on the Southern Line, and doubtless will be abundantly found in the mountainous country between these two districts. Then we have it at Mount Warning on the Tweed, and intermediate localities remain to be found. It probably will be found on the highest parts of Southern Queensland.

"This tree so far has only been found at the heads of gullies on the Blue Mountains, at the foot of precipitous sandstone cliffs, and always near the foot of waterfalls on the edge of the pools." (Original description.)

Following are specimens arranged according to localities:—

Western localities.—"A Mountain Ash." Adclina Falls, Lawson (R. T. Baker and H. G. Smith, April, 1899). The type. Mature leaves and immature fruits, which I was a long time in identifying with the Mount Wilson material I had collected three years previously. Sucker leaves were collected by W. Baeuerlen from the same place during the following month.

Natural seedlings, Leura (R. H. Cambage and J.H.M.).

Natural seedlings, plump buds and flowers. Blackheath (J.H.M.).

Mount Victoria (J. L. Boorman, myself and others, but mostly with unripe fruits).

Glaucous sucker leaves. Mt. Victoria and road to Jenolan Caves (R. H. Cambage, quoted in original description).

Mount Wilson. The type of *E. Luehmanniana* var. *altior*. (J.H.M., April, 1896.)

"Blackbutt," unripe fruits only available. Near Wolgan River (Henry Deane), Clarence to Wolgan (J. L. Boorman).

Southern localities.—Hill Top, in deep gullies (E. Cheel).

Northern localities.—Mt. Warning, near Murwillumbah, Tweed River, at 3,300 feet. A tree of 30–40 feet (W. Forsyth). Not to be distinguished from the type specimens of *E. Luehmanniana* var. *altior* from Mt. Wilson.

AFFINITIES.

1. With *E. Sieberiana* F.v.M.

This tree is allied to *E. Sieberiana* F.v.M., in the venation and shape of the leaves and nature of timber, but it differs from it in its smooth bark and shape of fruits. . . .

If it were not for the fruits and buds, it might be regarded as a smooth-barked variety of *E. Sieberiana* F.v.M.; but this cortical variation has now been shown to have very little to support it in the field, taken in conjunction with other features. (Original description.)

The Blue Mountains tree is known and cut commercially as "Mountain Ash." This is, of course, the ordinary name of *E. Sieberiana* F.v.M. The timbers of the two trees are not dissimilar, neither are the immature fruits (Deane and Maiden, *loc. cit.*). At Mount Irvine it is known as "Yellow Gum." (Forest Flora, xxvi, 101.)

There is undoubtedly a good deal of similarity between the half-ripened fruits of *E. oreades* and those of *E. Sieberiana*, sufficient, at least, to put one on one's guard, but the ripe fruits of *E. oreades* are very different.

2. With *E. saligna* Sm.

When seen in its native habitat it might easily be passed by as *E. saligna* Sm., but it differs from that species in the timber, fruits and chemical constituents of its oil, and venation of the leaves. . . . It very possibly has been looked upon or classed as *E. saligna* Sm., which is sometimes found on the banks of streams near the coast, both having a similar silver-grey shining bark. (Original description.)

The similarity in the two species is only in the general appearance of the two trees and in the situations in which it grows.

3. With *E. viminalis* Labill.

Here we have another tree similar to *E. oreades* to the extent that *E. saligna* is.

It is a typical ribbon Gum, the ribbons being 8 to 10 feet long, and even more, broad and tough. We think it very probable the species has been sometimes noted as *E. viminalis*, judging from its appearance as a ribbon Gum, but it is a handsomer and more erect species than *E. viminalis*. It is a tall tree, very straight, 60-100 feet high, and even more. It has absolutely clean, shiny stems except at the butt, say for 8 or 10 feet, where it is more or less fibrous. At Mount Wilson it is associated with *E. goniocalyx*, and at Mount Victoria with the same species to a less extent. (This work, IX, 289.)

4. With *E. dives* Schauer.

In the venation of the leaves it might also be classified with *E. dives* Schau., but in no other feature does it approach that species. (Original description.)

5. "The fruits are somewhat similar to those of *E. stricta* Sieb., *E. obtusiflora*, and *E. fraxinoides*, but smaller." (Original description.) This is a comparison based primarily on the immature fruits of *E. oreades*.

This species, *E. obliqua* and *E. fraxinoides* show an affinity in the venation of the leaves and in the shape of the fruits.

6. With *E. coriacea* A. Cunn.

The venation and timber, as well as fruits and flowers, differentiate it from *E. coriacea* A. Cunn., although some of its chemical constituents connect it with that species. In botanical sequence it is placed between *E. Sieberiana* F.v.M. and *E. coriacea* A. Cunn. (Original description.)

7. With *E. obtusiflora* DC. See under *E. obtusiflora*, at p. 297.8. With *E. virgata* Sieb.

In the original description of *E. Luehmanniana* (*virgata*) var. *altior*, Messis. Deane and Maiden say, "A tree which may be described as a form of *E. Luehmanniana*, with fruits and all other parts comparatively small." Here we have veritable geminate species, remarkably similar. *E. oreades* flourishes in colder situations than does *E. virgata*, of which it is the mountain form. The localities of the two species have been ascertained to approximate very considerably, and it is very probable that the (comparatively) cold tops at Kuring-gai Chase, the Penang Range, and National Park (all *E. virgata*), will approach very closely localities for *E. oreades*, whose nearest points are at present Hill Top gullies and Lawson gullies.

Messrs. Baker and Smith ("Research on the Eucalypts," p. 182, 1902) say, "Messrs. Deane and Maiden record this as the mountain form of what they regard as *E. virgata* Sieb. (*E. Luehmanniana*), a 'Mallee' of the coast, but our researches fail to show any connection whatever between these two trees, either in herbarium material, timber or field observations. . . . The tree thought to be this species in Tasmania is *E. Risdoni* Hook. f., the mature fruits of the two being somewhat alike."

I have not seen this statement modified, and it has doubtless arisen, in part, from Mr. Baker's figure of *E. oreades*, which depicts the uncharacteristic unripe fruit and the not characteristic intermediate leaf.

"It is simply a giant form of *E. Luehmanniana* (*virgata*), exhibiting that species in its best development. The mountains form is sometimes known as 'Yellow Gum,' and 'White Gum'" (Maiden in "Forest Flora," Part xxvi, p. 104). An experience of twenty-three years since I collected this species (as *E. Luehmanniana* var. *altior*) confirms the opinion I formed then. At the same time, I know few species in which there is so much difference between the shape of the ripe and of the unripe fruit, which therefore presents a pitfall to the botanist. Indeed, the type specimens are so far removed from the type specimens of *virgata* var. *altior* that they have deceived Mr. Baker himself. Mr. Baker's type specimen of *E. oreades* has been looked upon superficially as a starved specimen of *E. obliqua* many times, but no one could so mistake the type specimen of *virgata* (*Luehmanniana*) var. *altior*. The angularity and glaucousness of the branchlets also proclaim its affinity to *virgata*.

See also p. 297 (under *E. obtusiflora*).

DESCRIPTION.

CCXIV. *E. obtusiflora* DC.

In *Prod.* iii, 220 (1828).

A COPY of the original description, together with references to some of Sieber's specimens, will be found in Part IX, p. 276.

Following is G. Don's translation of the original:—

Operculum hemispherical, very blunt, shorter than the cup, which is obovate; peduncles rather angular, axillary length of the petioles; flowers 4–5 in each head; leaves lanceolate, mucronate, unequally attenuated at the base, coriaceous. Native of New Holland, on the eastern coast. Very like the preceding species, but differs in the flowers being larger, in the cup of the calyx being obovate, in the operculum being blunter, and in the leaves being broader. The mucrons of the leaves are deciduous as in the preceding species.

The "preceding species" is *E. cneorifolia* (*Gen. Hist. Dichlam. Plants*, ii, 820, where it is given *E. obtusifolia* in error).

Then Benthams (B.Fl. iii, 205) described it in the following words:—

Leaves mostly straight, oblong elliptical or almost lanceolate, acuminate, often all under 3 inches long, but in some luxuriant specimens more felcete, acuminate and attaining 5 inches, very thick and rigid, the veins oblique and parallel, but not close, the intramarginal one at a distance from the edge. *Peduncles* lateral or axillary, somewhat compressed, rigid, with an umbel of four to eight rather large flowers. *Buds* clavate. *Pedicels* much thickened upwards. *Calyx-tube* short and broad, fully 3 lines diameter. Operculum broadly hemispherical, obtuse or umbonate, thick, shorter than the calyx-tube. *Stamens* 2 to 3 lines long, all perfect; anthers reniform, with divergent cells, usually confluent at the apex. *Fruit* very hard and woody, ovoid-truncate, above $\frac{1}{2}$ inch long, the orifice scarcely contracted, the rim rather broad and concave, the capsule depressed.

I have described the species at Part IX, p. 277, of the present work.

Illustrations.—The juvenile (sucker) leaves vary in width and shape from narrow-lanceolate to broad-lanceolate, and even almost orbicular. Considerable variation is shown in figs. 8a and 7 of Plate 43. I have seen them even broader than as depicted at fig. 7, e.g., $1\frac{1}{2}$ miles north-west of Berowra Railway Station (W. F. Blakely and D. W. Shires), the following being actual measurements from fresh specimens:—10 x 7 cm. ($4 \times 2\frac{3}{4}$ in.), 7.5 x 5 cm. (3×2 in.), 13 x 6 cm. ($5 \times 2\frac{1}{4}$ in.), all being broadly lanceolate; 6.5 x 6 cm. ($2\frac{1}{2} \times 2$ in.) ovate. So that *E. obtusiflora* should be regarded as a species with broad sucker leaves. It is not easy to get representative specimens from this and allied species. As a rule, they can only be got a few months after a bush fire. This is one of the few localities in which I have observed this species and *E. virgata* together.

The fruits are more or less urceolate (particularly when young), and the rims may be thinnish (particularly when young) to thick and flat-topped. Sometimes they may be warted (8c), and such fruits may be reminiscent of those of *E. virgata*. For the fruits of *E. obtusiflora*, see Plate 43.

The species is sufficiently figured as follows:—

1. Fig. 3, Plate 43, Part IX, we have a portion of A. P. de Candolle's figure (doubtless of the type).
2. Fig. 4a-c, Plate 43, is drawn from the type. It is redrawn at figs. C and D, Plate 94, of my "Forest Flora of New South Wales."
3. Other drawings of fruits will be found at figures 5, 6 and 11 of Plate 43.

The fruits may be larger than those depicted, and the opercula are sometimes rugose. The sucker-leaves alone have not been adequately figured.

SYNONYMS.

1. *E. rigida* R.Br. (Sieb. *Pl. Exs.* as quoted by Bentham, B.Fl. iii, 205). The use of the name *E. rigida* (also used by Hoffmannsegg in 1826) is dealt with at length at Part IX, p. 273.
 2. *E. piperita* Sm., var. *pauciflora* DC. in *Prod.* iii, 219.
 3. *E. virgata* Sieb., var. *obtusiflora* Maiden, in Part IX, p. 276.
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RANGE.

It seems to be confined to New South Wales. Port Jackson (*Sieber* No. 473); Bargo Brush, *Backhouse*, are localities quoted by Bentham. One is practically coastal, and the other is a little inland, about 70 miles south of Sydney and 20 from the sea (as the crow flies).

It is common around Port Jackson and its estuaries, and in situations adjacent to the Pacific Ocean, both north and south of Sydney. Brisbane Water (Gosford) is the most northerly locality recorded so far, and the vicinity of Ulladulla (Conjola) the most southerly one. Only rarely has it been found, so far, a few miles inland. It attains a far larger size in sheltered, deep sandy localities around Port Jackson, than on hungry sandstone plateaux.

Berowra (W. F. Blakely and D. W. Shiress) already referred to. This is a locality getting away from the coast-line.

"Mallee-like, but sometimes only two or three plants together. Stems slender, 3-5 inches in diameter. Forms bushy—like small trees of 10-15 feet. Young bark greenish or bluish, peeling off in ribbons when old. Young tips only slightly yellow." The Spit, near Manly. (W. F. Blakely and J. L. Boorman.) Another report, made by Mr. Blakely to me on 26th August, 1918, says, "Rather tall shrub, branches smooth and glaucous, with a few loose ribbons hanging from them. Obtained from near cottage by the roadside, on the Spit-Manly road, near The Spit, this day. Mr. Boorman informed me that this was the only plant he knew of at the time, and that the 1914 and 1917 specimens collected by him were obtained from it." See this work, Part IX, p. 282.

It used to be exceedingly abundant not far from the foreshores in many other parts of Port Jackson and its estuaries. Such localities are too numerous to individualise.

Some localities south of Port Jackson are as follows :—

Loftus; just below station, on right hand side of road leading to Audley's (J. H. Camfield). Fruits figured, also pair of juvenile (sucker) leaves, at fig. 7, Plate 43.

National Park (E. Betcher). (Fruits figured.) Port Hacking (E. Cheel).

Then we have a gap, but I have seen it in intermediate localities. Jervis Bay (J.H.M.).

Rims of fruits narrowish, leaves up to broadish. Conjola (W. Heron).

The two latter specimens are not strictly typical, and are referred to in this work, Part IX, p. 281, under *E. virgata*. Having reconsidered them, I attribute them to *E. obtusiflora*, and feel that if the vicinity of the coast be searched we shall find specimens from these two localities (and, indeed, from further south) more closely resembling the type.

AFFINITIES.

1. With *E. obliqua* L'Hérit.

"Allied to *E. obliqua*, but with much more rigid, straighter leaves, the flowers larger, and the fruit much larger and differently shaped." (B.Fl. iii, 205.)

2. With *E. stricta* Sieb.

Its affinity, however, is with *E. stricta*, of which it is practically the coastal form. At the same time I believe the species to be sufficiently distinct, and perusal of the table on page 289 may sufficiently indicate their similarities and the reverse.

The suckers of *E. obtusiflora* are broadish, and those of *E. stricta* narrowish.

3. With *E. virgata* Sieb. and *E. oreades* R. T. Baker.

These two species may be compared with *E. obtusiflora*, as follows :—

<i>E. obtusiflora</i> DC.	<i>E. virgata</i> Sieb.	<i>E. oreades</i> R. T. Baker.
Branchlets terete, or only the very young ones imperfectly angular. Leaves oblong-straight, or only slightly falcate.	Branchlets quadrangular or winged. Leaves coarse.	Branchlets compressed or slightly angular, leaves long, falcate.
Petioles not decurrent.	Petioles decurrent.	Petioles long, but not decurrent.
Peduncles uniform, not dilated, almost terete when fully developed, <i>never flat</i> .	Peduncles dilated upwards with sharp edges, remaining compressed.	Peduncles compressed, dilated upwards, but only about half as broad as <i>E. virgata</i> .
Pedicels terete.	Pedicels compressed or angled in bud, often quadrangular in fruit.	Pedicels compressed or terete, not angled.
Operculum very short, with a minute point or none.	Operculum with a long beak.	Operculum concid. not large.
Fruits urceolate to semi-globose, wrinkled, without angles. Rarely 5-celled, except in very large fruits.	Fruits campanulate-truncate, imperfectly winged by the angled pedicels, and also irregularly longitudinally streaked. Frequently 5-celled.	Fruits somewhat urceolate to semi-campanulate, the rim convexed in some forms, lightly domed or truncate in others, the small forms 4-celled, the large 5-celled; smooth, not ridged as in <i>E. virgata</i> .

DESCRIPTION.

CCXV. *E. fraxinoides* Deane and Maiden.

In *Proc. Linn. Soc. N.S.W.* xxiii, 412 (1898), with a Plate.

FOLLOWING is the original description :—

A tall tree.

Bark.—Belongs to the smooth-barked group. Outer layer falling off in ribbons; the bark blotched, reminding one somewhat of a Spotted Gum (*E. maculata*) as regards its blotches, and *E. viminalis* (Ribbon Gum) as regards the stripping of the outer bark.

Timber.—Pale coloured, light in weight and colour, fissile. Makes handsome bedroom furniture, and may be substituted for American Ash. Is used for snow-shoes in the Kiandra district. It is used in the Bombala district for lining instead of pine; also for panels and sash-work, as well as casks and butter kegs. Because of its resemblance to American Ash it goes under the name of White Ash; it also goes under the name of Mountain Ash, a name which, however, should be reserved for *E. Sieberiana*. In allusion to the resemblance of the timber to Ash, we propose the name *fraxinoides* for this species.

Sucker leaves.—Alternate, varying from bluntly lanceolate to almost linear-lanceolate; slightly falcate; twigs very glaucous.

Peduncles.—Flattened.

Buds.—Ovoid when young; as growth proceeds the operculum more or less pointed at the top, and thus assuming a somewhat conical shape; up to seven or eight in the umbel.

Stamens.—Inflexed in bud. The stamens in the young bud much resemble those of *E. stricta* as figured in "Eucalyptographia." Anthers reniform, with a very large gland at the top (in a very young state).

Fruit.—Shining, nearly globular; usually $\frac{1}{16}$ inch in diameter, or a little less; urceolate in young fruit, the neck being almost lost in the mature fruit. The rim sharp. The valves usually five and very depressed.

The juvenile (sucker) leaves from Bemboka Peak (W. Bæuerlen), and those from Parker's Gap (W. A. W. de Beuzeville), are narrow-lanceolate, but scanty. Those from West Albion Park (R. H. Combage, June, 1901) are broadly lanceolate (up to 2 inches wide). In variation and general appearance there would appear to be a good deal of similarity between these leaves and those of *E. virgata* and *E. obtusiflora*.

Illustrations.—I believe that the juvenile leaves of *E. fraxinoides* and of its var. *triflora* are not to be distinguished from each other, and that the broad (17a) and narrow suckers (17b), depicted in Plate 43, fairly illustrate those of the normal form also.

The type is figured at Plate XIX of *Proc. Linn. Soc. N.S.W.*, vol. xxii, as already stated. The buds with short opercula are shown, but the fruits are shown a little too urceolate. A fragment of the type is again shown at 1a-d, Plate 44 of the present work, and another specimen at 5a-c of the same Plate. When I add that the

suckers of the normal species appear to be identical with those of the variety *triflora*, and that these are shown at 17*a* and *b* of Plate 44, and also (as regards a broadish pair) at H of Plate 94 of my "Forest Flora of New South Wales," it would appear that, considering how much illustrative work remains to be done, *E. fraxinoides* has been sufficiently illustrated for the present.

SYNONYM.

E. virgata Sieb., var. *fraxinoides* Maiden, in Part IX, p. 278 (1907), of the present work.

We know *E. virgata* better now, and that it is synonymous with *E. Luehmanniana*, see p. 286. At one time *E. fraxinoides* was considered to be a species closely allied to *E. stricta*, and also to *E. obtusiflora*, but with a pointed operculum.

RANGE.

So far as we know, this species is confined to New South Wales, but it is very probable it will be found in Victoria, in the mountainous country near the border of the two States.

The type came from the County of Wellesley, and it is recorded from a number of localities from the County of Auckland, both counties being near the south-west boundary of New South Wales. I expect to find it in the three adjacent northerly counties of Wallace, Beresford and Dampier, but, as a matter of fact, I have only received it from the still more northerly counties of Murray and St. Vincent. It is recorded from some localities in the eastern half of the County of Camden. It probably will be found, when its identity is better understood, that the normal species and its variety will be found to have the same general range, and that that range will be the mountainous eastern part of the State from the Victorian border, at least as far north as the Blue Mountain Range.

Tantawanglo Mountain (Henry Deane and J.H.M., 1896). The type.

"White Ash," Forest Reserve No. 911, Parish Colombo, County Auckland. (Assistant Forester Harrison and District Forester Chulec.) "White Ash," Bemboka Peak (W. Baeuerlen, 1889). Practically the same as the preceding locality.

About 20 miles east of Nimitybelle, east of the Great Dividing Range, N.E. of head of Kybean River (R. H. Cambage No. 1923). The above four localities are no great distance from each other.

Sugar Loaf Mountain (Monga), Braidwood (W. Baeuerlen). Recorded previously as *E. stricta* var. (Part IX, pp. 279, 282.) "Tall trees of 40-60 feet, and 12-14 feet in girth. The butts of the trees have a fibrous-scaly bark, becoming clean-stemmed onwards. Known locally as White Gum." Sugar Loaf Mountain (J. L. Boorman).

Tree of 15 to 20 feet high, top of Mt. Budawang (J. L. Boorman, March, 1909). Tree about 30 feet high, a symmetrical pyramidal tree. Near top of Mt. Budawang (4,000 feet), Mongarlowe, Braidwood district (F. W. Wakefield, No. 18, May, 1918).

"White Mountain Ash.' State Forest, No. 577. Tallaganda, Braidwood district. It is only found on the crowns or highest points of the main ridge, Jinderoo Pass, &c." (C. Weston, No. 56). The mill hands call it 'Ribbony Peppermint,' as the top is whitish with ribbony bark, while the barrel is rough—more, to my mind, like a messmate." (Forest-Guard Ralph C. Blacket.)

"White Mountain Ash." "The most highly-prized of all local timbers. Has a rough, non-fibrous bark, extending about 5 to 8 feet up the stem, when the bark becomes quite smooth and white." Parker's Gap, between Queanbeyan and Braidwood. (W. A. W. de Beuzeville, Forest Assessor, Forestry Commission, No. 6.)

Mr. de Beuzeville furnishes the following interesting report:—

It is the predominating timber on the extreme southern portion of the Tallaganda State Forest, and I am informed it continues right along the range in the same abundance as far at least as the Big Badger. It appears to have a very low fire-resisting power. When overlooking Tallaganda State Forest from any high knob, the belts of this species can be easily located by the dead and whitened tops of the fire-killed trees, though the surrounding species (generally *E. regnans*) have quite recovered. Not only scattered trees are destroyed in this way, but whole belts are killed outright. I have seen in the vicinity of Mount Tumanang, in the parish of Oronmceer, belts of 400 to 500 acres of this timber absolutely destroyed, not a living tree left in the belt. These belts contain trees of all sizes, and eggs, and all have suffered equally. It is a most remarkable sight, these belts of fire-killed timber, when viewed from above, giving the impression of the settlers' ringbarked paddocks in the heart of the mountains. The species appears to be a very free regenerator, and a few years after a fire has killed out a belt, a dense growth of seedlings appears. I have seen some of these old burns carrying an average of 500 trees over 6 inches in diameter per acre. It is the most prolific regrowth that I have seen. The tree generally favours the roughest granite spurs, usually on the top if there are plenty of boulders, but if the spur top is fairly smooth, it then grows on the rough slopes.

"Arboreal form of *E. stricta*" (see Part IX, p. 282). Trees up to 40 feet high. Scaly bark at base, whitish and smooth on upper part of trunk. Suckers up to 2 inches broad. West Albion Park, near Macquarie Pass (R. H. Cambage, June, 1901).

"Arboreal form of *E. stricta*," 2 feet in diameter. Growing just under edge of cliff. Hawkesbury sandstone. Bong Bong Pass, West Dapto (R. H. Cambage, 19th May, 1901).

Fitzroy Falls (R. H. Cambage and J.H.M.).

AFFINITIES.

1. With *E. stricta* Sieb.

The affinity of this species is closest to *E. stricta*. It differs from the latter in being a large tree, in the shape of the fruits, and in the venation of the leaves. (Original description.)

This is the species with which it is likely to be confused. *E. stricta* is usually a Mallee-like plant (only exceptionally it is a tree), while *E. fraxinoides* and its variety are trees, and sometimes attain a considerable size. The fruits of both *E. stricta* and of the var. *triflora* have some tendency to be urceolate, but those of the variety are sessile and in threes, and usually larger than those of *E. stricta*.

See also the table at p. 289.

2. With *E. maculata* Hook.

The fruits are sometimes not very dissimilar in shape to those of *E. maculata* and the small form of *E. corymbosa*, but the White Ash has no real affinity with either species, as it belongs to a different group entirely. (Original description.)

VARIETY.

Var. *triflora*, var. nov.

"Fruits nearly sessile, and in threes, hence the name proposed for this variety. Fruits nearly hemispherical, with a slight tendency to be urceolate." This is the original description (considered as *E. virgata* var. *triflora*) taken from my "Forest Flora of New South Wales," xxv, 87. It seems, however, more closely allied to *E. fraxinoides*.

It is figured at 2a, 2b, Plate 44 (leaf and unripe fruits of type); 17a-d, Plate 43, with fruits a little more urceolate than in the type. Also figures H, K, L, Plate 94, of my "Forest Flora of New South Wales," in which a pair of the sucker-leaves are more clearly shown.

SYNONYMS.

1. *E. virgata* Sieb., var. *triflora* Maiden, in "Forest Flora of New South Wales," XXV, 87 (1907); this work IX, p. 279.
2. *E. stricta* Sieb. (arboreal form); in part, this work, Part IX, p. 278.

RANGE.

I only know it from three localities, all in New South Wales. It has been usually confused with *E. stricta*, and even yet it is but imperfectly known, but further localities will, I am confident, soon be recorded. The Pigeon-House and the Nerriga-Sassafras localities are both in the County of St. Vincent, and the latter is perhaps 25 miles north of the former. The Blackheath locality is a considerable distance further north. There is no doubt it is destined to be found frequently in the mountainous counties of St. Vincent, Murray, Argyle, Camden, Westmoreland and Cook.

The following extract is taken from my "Forest Flora of New South Wales," xxv, 87 (1907):—

Top of Pigeon-house Mountain (2,360 feet), near Milton (R. H. Cambage).

A small tree, a White Ash.

Mr. Cambage's note is—"Bark dark, rough at base, then tones off. Lower part only a little rough. Not even as rugged as *E. pilularis*."

"A tall tree of 40-60 feet high. Bark of a stringy nature, not corrugated. Reminds one of that of *E. Consideniana*. Grows in the vicinity of Mountain Ash (*E. Sieberiana*). Nerriga-Sassafras—Nowra road (J. L. Boorman). This specimen has fully ripe shining fruits.

Blackheath (J. H. Maiden, January, 1905), as *E. virgata* var. *stricta* (arboreal form in part), as already indicated.

"The fruits of the arboreal form of *stricta* from Blackheath are also sessile, and are akin to this form. It would be desirable to ascertain, over large areas of country, to what extent the arboreal form of var. *stricta* has sessile fruits in threes."

Explanation of Plates (160-163).

PLATE 160.

E. nitida Hook. f.

1. Juvenile leaves. See p. 235, Part XXXVIII; also *Proc. Roy. Soc. Tas.*, p. 84 and Plate XII (1918). Guildford Junction, Tasmania. (R. H. Cambage.)

E. Torelliana F.v.M.

- 2a. Juvenile leaf, peltate; 2b, juvenile leaf; 2c, mature leaf [N.B.—2b and 2c came from the same twig]; 2d, mature leaf; 2e, buds; 2f, fruits. Atherton, Northern Queensland. (H. W. Mearns.)
- 3a. Juvenile leaf; 3b, flowers; 3c, front and back view of anther. Cairns district. (F. M. Bailey.)
- 4a. Juvenile leaf, not in the earliest stage; 4b, buds. Rockingham Bay. (J. Dallachy.) Portion of the type from Herb. Melb.

PLATE 161.

E. corymbosa Sm.

(See also Plate 162.)

1. Fruit of "*Metrosideros gummifera*," Gaertner, *De Fructibus*, tab. xxxiv, fig. 1 (1788), from the Banksian Herbarium, and therefore collected at Botany Bay in 1770. This was subsequently cited as *E. resinifera*. See Part XXX, p. 208.
2. Very urceolate fruits. Como, George's River, near Sydney. (J. L. Boorman.)
- 3a. Buds; 3b, fruits. Port Jackson. (J.H.M.)
4. Facsimile of portion of tab. 340, Cavanilles' *Icones*, being his plate of "*Eucalyptus corymbosus*."
5. Juvenile leaf. The petiole is deeply channelled, with the bristles on the outside only. Hornsby, a few miles north of Port Jackson. (W. F. Blakely.)
6. Juvenile leaf, quite glabrous, and the venation becoming more pinnatived. Milson Island, Hawkesbury River. (J.H.M.)
- 7a. Juvenile leaf, quite glabrous; 7b, large intermediate leaf; 7c, front and back view of anther. Hornsby. (W. F. Blakely.)
8. Mature leaf, still in the opposite stage, showing the affinity, in this respect, to *Angophora*. Suspension Bridge, Willoughby, near Port Jackson. (J. L. Boorman.)

PLATE 162.

E. corymbosa Sm.

(See also Plate 161.)

- 1a, 1b. Broad and narrow mature leaves; 1c, ovoid fruits. Eden, Twofold Bay, N.S.W. (A. W. Howitt.)
2. Ovoid fruits. Ph. Moonee, Co. Woolgoolga, N.S.W. (E. H. F. Swain, No. 31.)
- 3a. Buds; 3b, ovoid fruit. Bribie Island, Southern Queensland. (C. T. White.)
4. Small fruited form, Barron Falls, near Cairns, Northern Queensland. (R. H. Cambage, No. 3847.)
5. Portions of the type of *E. purpurascens* Link., var *petiolaris* DC. See p. 245.
6. Portion of the type of *E. oppositifolia* Desf. See p. 244.

E. intermedia R. T. Baker.

- 7a. Shrivelled young urceolate fruits; 7b, mature fruits, urceolate to ovoid. Eden, Twofold Bay, N.S.W. (Forest Guard H. H. Rose, No. 11.)
- 8a. Mature leaf; 8b, flowers; 8c, anthers; 8d, fruits. Sources of the Clyde River, N.S.W. (W. Baerlein, No. 37.)
- 9a. Mature leaf; 9b, urceolate fruits. "White or Pale Bloodwood," Ph. Bohnock, Co. Gloucester, N.S.W. (District Forester J. J. Hardiman.)

PLATE 163.

E. intermedia R. T. Baker.

(See also Plate 162.)

1. Fruits. "The common Bloodwood, but the timber showed the palest hue I have seen in Bloodwood, possibly what is called White Bloodwood." Fernmount, Bellinger River, N.S.W. (E. H. F. Swain.)
- 2a. Leaf; 2b, fruits. "White Bloodwood." Glenreagh, 28 miles from Grafton, N.S.W. (J. L. Boorman.)
- 3a. Leaf; 3b, fruits. "Pale or Pink Bloodwood," Glenreagh. (J. L. Boorman.)

PLATE 163—*continued*.

- 4*a*, Leaf; 4*b*, unripe fruit; 4*c*, nearly sessile, speckled fruits; 4*d*, fruits with comparatively long pedicels.
 "Bastard Bloodwood." Ballina, N.S.W. (W. Baeuerlen, No. 314.) The type.
- 5*a*, Leaf; 5*b*, buds; 5*c*, fruits. "White Bloodwood." Eight-mile Plains, near Brisbane. (J. L. Boorman.)
- 6*a*, 6*b*, 6*c*, Fruits. "Pale Bloodwood." Cooloolabin, Blackall Range, South Queensland. (Forest Ranger Horsman, through C. T. White.)

E. patellaris F.v.M.

- 7*a*, 7*b*, Mature leaves; 7*c*, bud; 7*d*, fruit. Upper part of the Roper River, Northern Territory. (F. Mueller, 3rd July, 1856, in the Gregory Expedition.) The type.

E. celastroides Turcz.

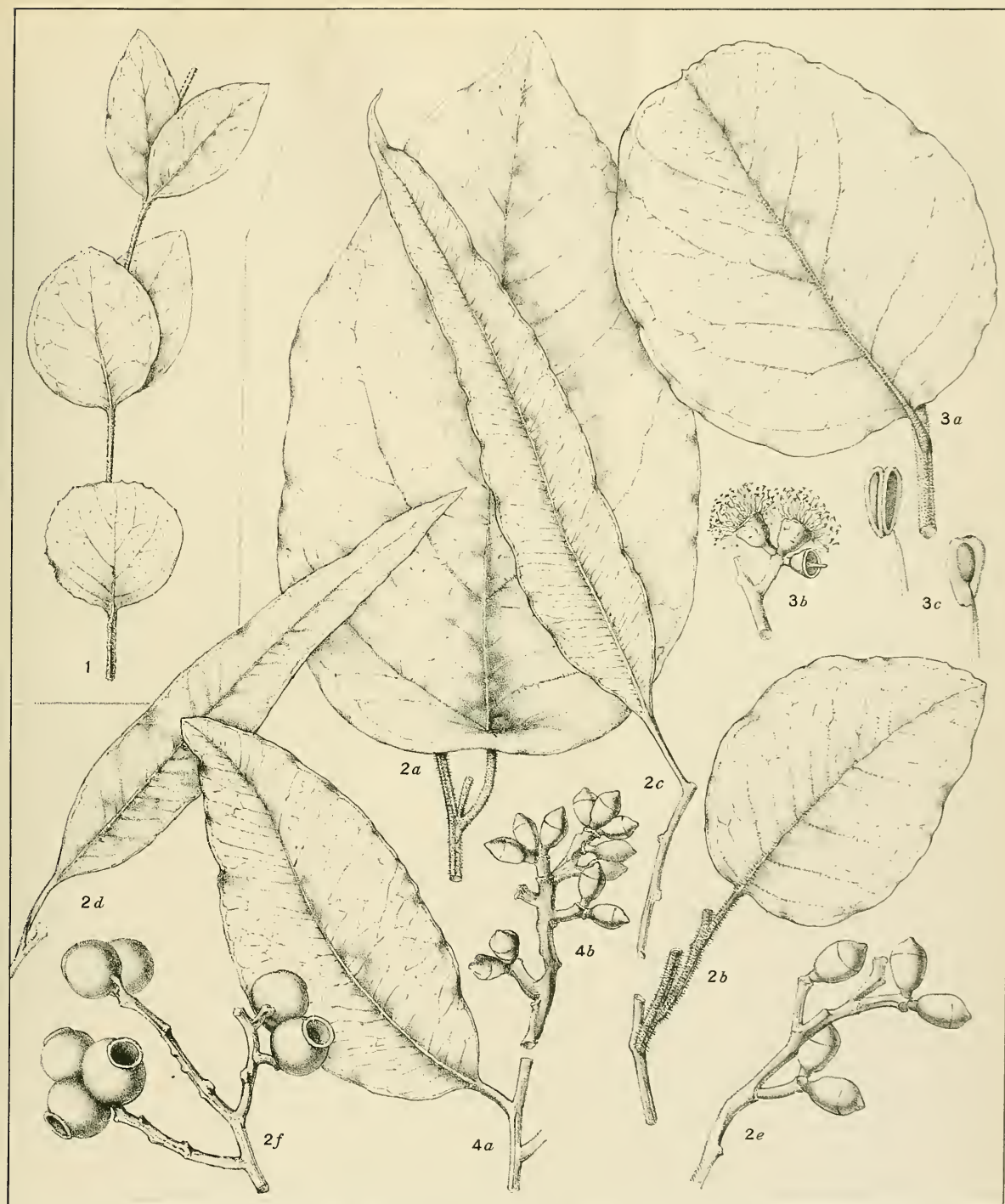
(See also Plate 10.)

8. Juvenile foliage. 70 miles north of Kurrawang, W.A., on the Wood-line. (J.H.M.)

The following species of *Eucalyptus* are illustrated in my "Forest Flora of New South Wales"* with larger twigs than is possible in the present work; photographs of the trees are also introduced wherever possible. Details in regard to their economic value, &c., are given at length in that work, which is a popular one. The number of the Part of the Forest Flora is given in brackets :—

- | | |
|---|--|
| <i>acacioides</i> A. Cunn. (xlviii). | <i>meliadora</i> A. Cunn. (ix). |
| <i>acmenioides</i> Schauer (xxxii). | <i>microcorys</i> F.v.M. (xxxviii). |
| <i>affinis</i> Deane and Maiden (lvi). | <i>microtheca</i> F.v.M. (lii). |
| <i>amygdalina</i> Labill. (xvi). | <i>numerosa</i> Maiden (xvii). |
| <i>Andrewsi</i> Maiden (xxi). | <i>obliqua</i> L'Hérit. (xxii). |
| <i>Baileyana</i> F.v.M. (xxxv). | <i>ochrophloia</i> F.v.M. (l). |
| <i>Baueriana</i> Schauer (lvii). | <i>odorata</i> Behr and Schlechtendal (xli). |
| <i>Baueriana</i> Schauer var. <i>conica</i> Maiden (lviii). | <i>oleosa</i> F.v.M. (lx). |
| <i>Behriana</i> F.v.M. (xlv). | <i>paniculata</i> Sm. (viii). |
| <i>bicolor</i> A. Cunn. (xlv). | <i>pilularis</i> Sm. (xxx). |
| <i>Boormanii</i> Deane and Maiden (xlv). | <i>piperita</i> Sm. (xxxiii). |
| <i>Bosistoana</i> F.v.M. (xliii). | <i>Planchoniana</i> F.v.M. (xxiv). |
| <i>Caleyii</i> Maiden (lv). | <i>polyanthemus</i> Schauer (lix). |
| <i>capitellata</i> Sm. (xxviii). | <i>populifolia</i> Hook. (xlvii). |
| <i>Consideniana</i> Maiden (xxxvi). | <i>propinqua</i> Deane and Maiden (lxi). |
| <i>coriacea</i> A. Cunn. (xv). | <i>punctata</i> DC. (x). |
| <i>corymbosa</i> Sm. (xii). | <i>regnans</i> F.v.M. (xviii). |
| <i>crebra</i> F.v.M. (liii). | <i>resinifera</i> Sm. (iii). |
| <i>dives</i> Schauer (xix). | <i>rostrata</i> Schlecht. (lxii). |
| <i>fruticetorum</i> F.v.M. (xlii). | <i>rubida</i> Deane and Maiden (lxiii). |
| <i>gigantea</i> Hook. f. (li). | <i>saligna</i> Sm. (iv). |
| <i>goniocalyx</i> F.v.M. (v). | <i>siderophloia</i> Benth. (xxxix). |
| <i>hamastoma</i> Sm. (xxxvii). | <i>sideroxylon</i> A. Cunn. (xiii). |
| <i>hemiphloia</i> F.v.M. (vi). | <i>Sieberiana</i> F.v.M. (xxxiv). |
| <i>longifolia</i> Link and Otto (ii). | <i>stellulata</i> Sieb. (xiv). |
| <i>Luehmanniana</i> F.v.M. (xxvi). | <i>tereticornis</i> Sm. (xi). |
| <i>macrorrhyncha</i> F.v.M. (xxvii). | <i>virgata</i> Sieb. (xxv). |
| <i>maculata</i> Hook. (vii). | <i>vitrea</i> R. T. Baker (xxiii). |
| <i>melanophloia</i> F.v.M. (liv). | |

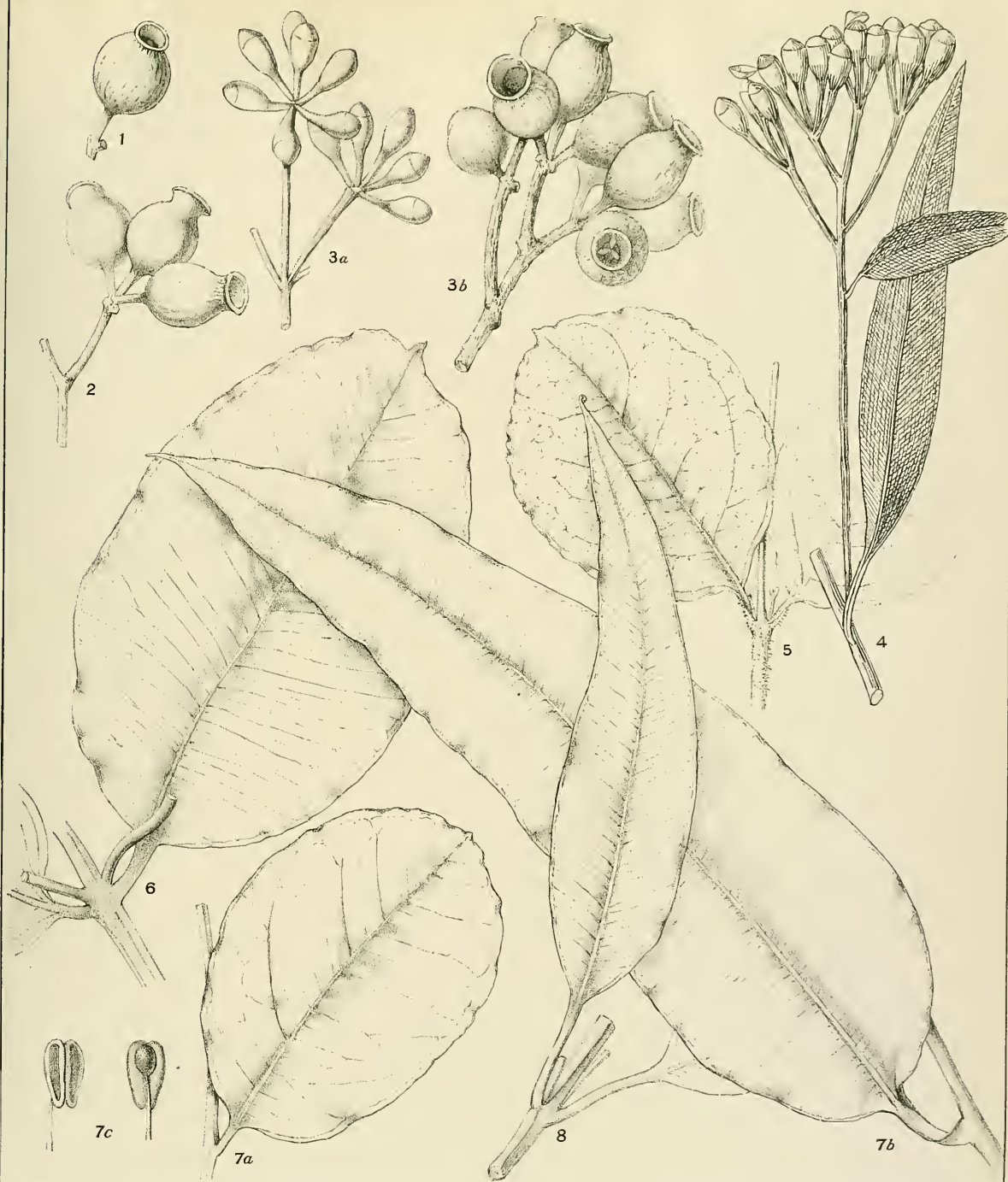
* Government Printer, Sydney. 4to Price 1s. per part (10s. per 12 parts); each part containing 4 plate other illustrations.



EUCALYPTUS NITIDA Hook f. (1)

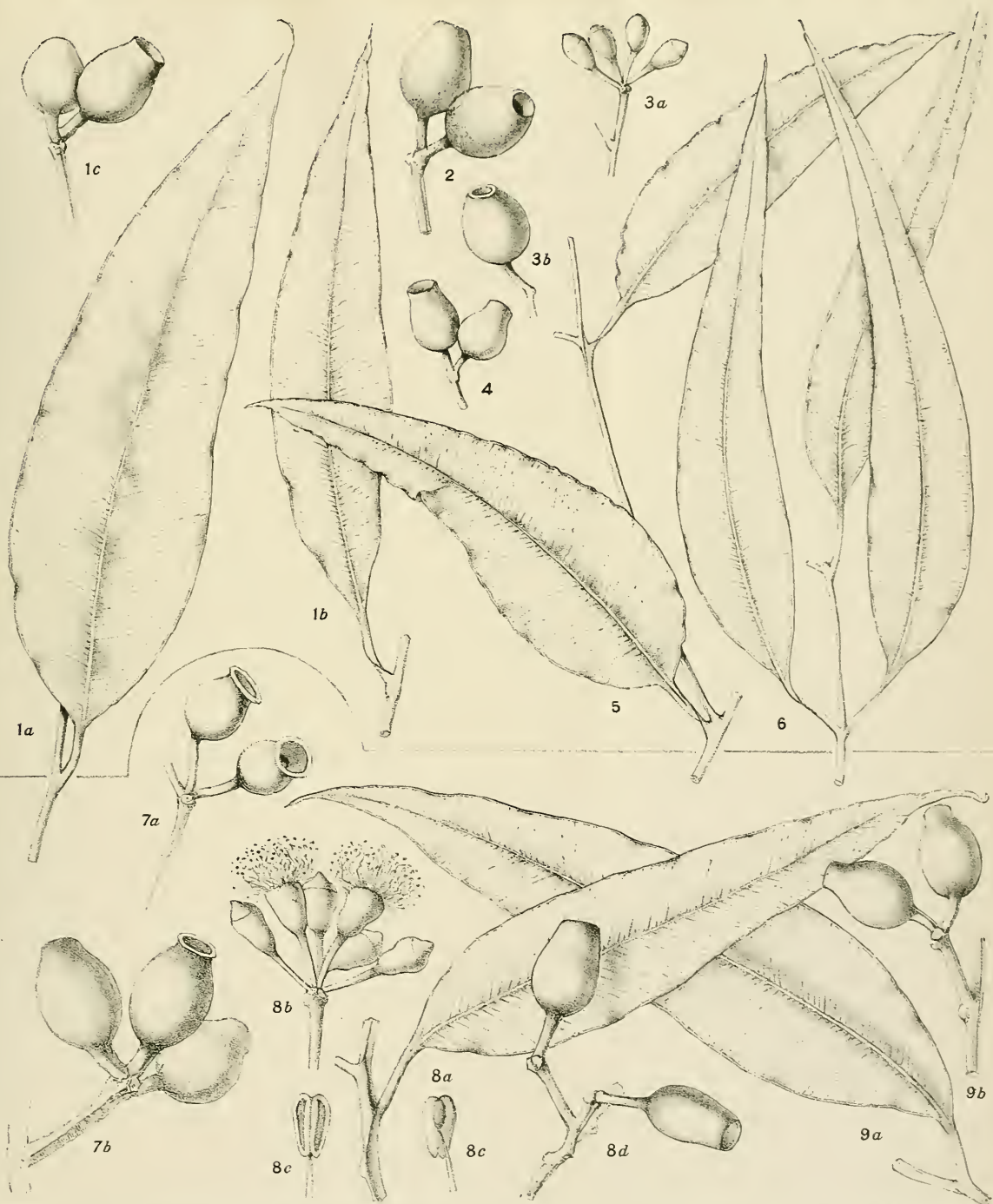
E. TORELLIANA F.v. M. (2-4)

M. Floeckton del. et lith.



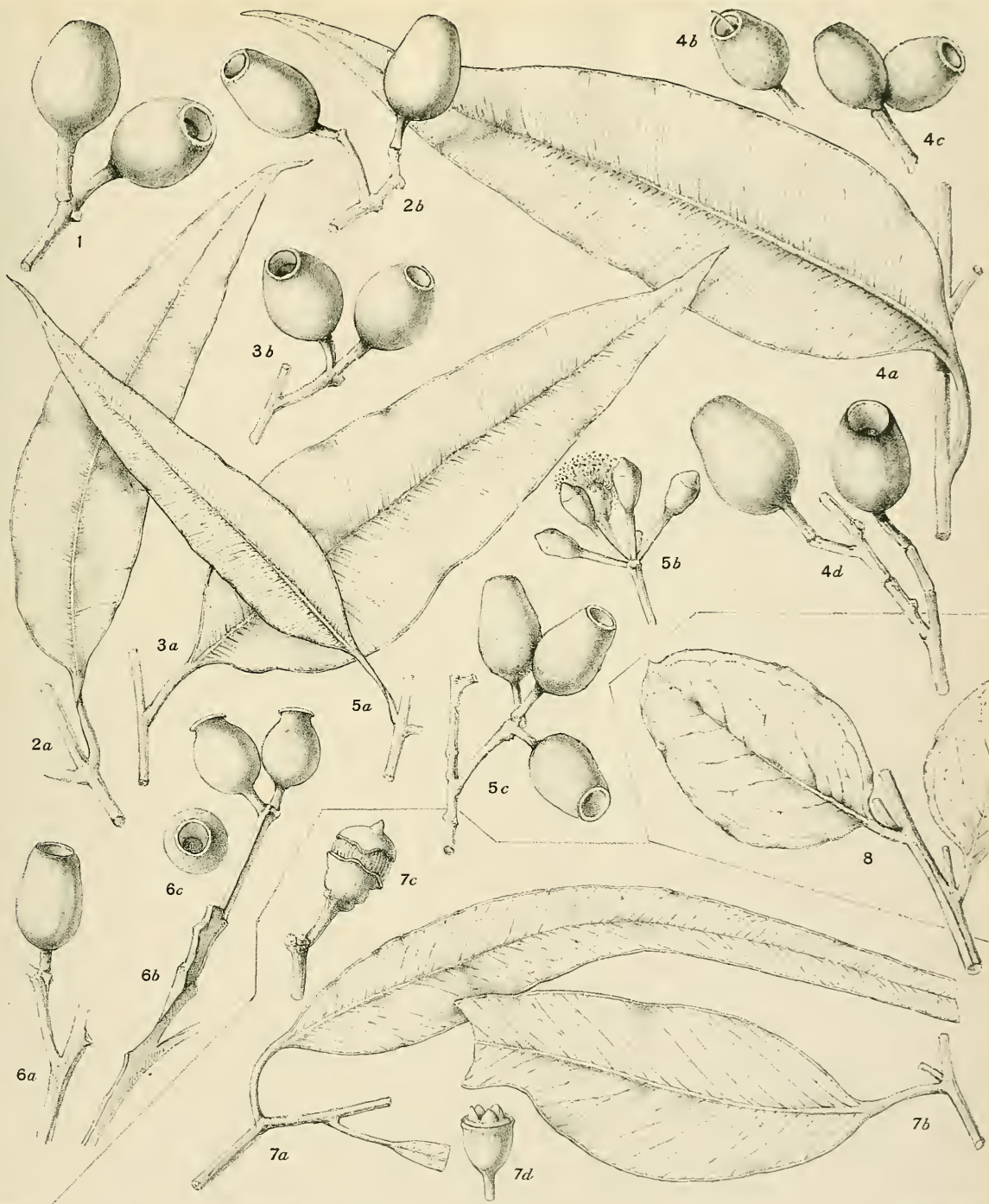
M. Flockton del. et lith.

EUCALYPTUS CORYMBOSA Sm. [See also Plate 162.]



EUCALYPTUS CORYMBOSA SM. (1-6) [See also Plate 161.]

E. INTERMEDIA R. T. BAKER. (7-9) [See also Plate 163.]



EUCALYPTUS INTERMEDIA R. T. BAKER. (1-6) [See also Plate 162.]

E. PATELLARIS F.v.M. (7)

E. CELASTROIDES TURCZ. (8) [See also Plate 10.]

DESCRIPTION.

CCXVI. *E. terminalis* F.v.M.

Journ. Linn. Soc. iii, 89 (1859).

FOLLOWING is a translation of the original :—

A tree, the branches somewhat terete, rigid, *leaves* alternate, somewhat thick, falcate-lanceolate, acuminate, opaque, faintly penniveined, imperforate, the same colour on both sides, with moderate petioles, the peripheral vein obscure, close to the margin, *umbels* with 3-6 flowers, crowded together in broad terminal panicles, the partial *peduncles* slightly longer than the *pedicels* and terete like them, the *fruit* large, truncate-ovate, sub-campanulate ex-angular, ecostate, four-celled, smooth at the vertex, almost twice as long as the pedicels, the valves nearly touching the orifice, *seeds* with long wings.

Found in meadows and dry fertile plains of intra-tropical Australia, not rare.

A medium-sized or large tree. The bark dark fuscous, persistent, wrinkled and scaly, brown or ferruginous within, coming away somewhat tardily in irregular flakes. Leaves 5-7 inches long at most, below, about an inch broad or a little narrower. Fruits slightly longer than an inch, *scarcely contracted at the mouth*. [The italics mine.—J.H.M.]

Bentham (B.Fl. iii, 257) redescribed it as follows :—

A tree, very closely allied to *E. corymbosa*, and often scarcely to be distinguished from it in the dried specimens. It is generally of a paler or more glaucous colour, the *leaves* usually narrower with less conspicuous veins, the *operculum* very obtuse, hemispherical and not showing the junction with the calyx-tube till just as it is detached, the *fruit* narrower, more oblong and less urceolate, that is, contracted at the orifice without so distinct a neck; it varies in size from about 7 lines to nearly 1 inch long. *Seeds* with a rather long wing.

Mueller does not figure this species in "Eucalyptographia," though he retains the name in the 1st and 2nd editions of his "Census of Australian Plants."

Native names: On the Cloncurry, "Narm-boon-bong"; on the Gilbert, "Kuleha" (E. Palmer).

Often the bark is so pale-coloured and so comparatively smooth, that it is called "White-stemmed Gum-tree" (Baldvin Spencer, "Narrative, Horn Expedition," p. 125, speaking of the southern part of the Northern Territory), while "Smooth-stemmed Bloodwood" is a common appellation round Darwin. Captain S. A. White's photo. in Plate XXXIII (Vol. xxxviii, *Roy. Soc. S.A.*) shows it to resemble a White Gum in general appearance in the Macdonnell Ranges.

Mr. R. H. Cambage says that its wood is deep red in colour, and that it is regarded as the best of the Bloodwood timbers around Alma-den, North Queensland.

The umbels have three to six flowers crowded together (original description). It will be observed that they are rather large, with opercula often inclined to be flattish, tearing off irregularly, often showing the scar of an outer operculum, and only about half the length of the calyx-tube. Mr. R. H. Cambage says that some old buds which had perished and remained on the tree at Alma-den were about 7 mm. in diameter.

Fruit truncate-ovate, sub-campanulate, slightly longer than an inch, scarcely contracted at the mouth, almost twice as long as the pedicels (original description).

Mr. Cambage, speaking of North Queensland trees, says that—

At the time the flowers fall, the very young fruits are sometimes oboconical, and their shape is not then in the least suggestive of the mature form. The fruits vary from urceolate to almost cylindrical with very little contraction at the neck, and the shape changes with the development of the seed vessels. The fruits seen range from 1.6 cm. to 2.4 cm. in length, the diameter being from about 1.1 to 1.2 cm., and the width across the usually thin rim 6 to 7 mm., the capsule sunk.

For further notes on the buds and fruits, see under Northern Territory, p. 310.

The fruits figured on Plates 164 and 165 are illustrative of variation in the species, so far as I have noted it. The fruits may be described as cylindroid, not so contracted in the neck as those of most species of the *Corymbosæ*, with thick walls and rims usually flat-topped.

Manna is procured from the leaves and small branches by being gathered and laid on pieces of bark, when the particles of sugar or gum fall off, or are scraped off with mussel-shells into a Kooliman (bowl), or the leaves, when covered with the white exudation, are pounded together with a stone and roasted in the ashes. Sometimes the sugary particles are gathered as they fall from the trees. After the rainy season this food is said to be abundant. (E. Palmer, *Proc. Roy. Soc. N.S.W.*, xvii, p. 98, 1883.)

I have a duplicate of the specimen submitted by Palmer to Mueller at the time. It came from Cloneurry and the Gilbert River. Roth, "Bull. No. 3 of North Queensland Ethnography," records it from the Pennefather and Batavia Rivers, and gives the native name as "Raru." In No. 5 of the same Bulletins he says "The gum (kino) mixed with water, is used for dysentery on the Palmer. (Middle) Palmer River, native name 'Ga-ja.'"

Other Plants referred to this Species.

1. *E. terminalis* Britten non. F.v.M., in "Botany of Captain Cook's Voyage," ii, Plate 117, from Lizard Island and Thirsty Sound, North Queensland, I have referred to *E. crebra* F.v.M. in Vol. II, p. 64, of the present work. It is a small-fruited species, not a large-fruited one like *E. terminalis* F.v.M. Mr. Britten's reference is to Gaertner's *De Fructibus* i, 171, and the corresponding Tab. xxxiv, fig. 3, consists of two small-fruited specimens.

2. *E. terminalis* Sieb. Pl. Exs., is, according to Bentham (B.Fl. iii, 211), *E. paniculata* Sm.

Fleshiness of the Calyx-tube.

In no group of Eucalypts is the wall of the calyx-tube more fleshy than in certain members of the *Corymbosæ*. The wall is comparatively thick and hence shrivelling in young fruits dried for the herbarium is common, and in no species more so than in

E. terminalis. Most Eucalyptus fruits preserve their shape in drying, and hence this irregular drying in folds, not causing cracks, attracts attention. It so impressed the late Mr. F. M. Bailey that he proposed the variety name *carnosa* for fruits of *E. terminalis* (always unripe).

SUPPOSED VARIETY.

Var. *carnosa* F. M. Bailey, in *Queensland Agric. Journ.* xv, 898, June, 1905.

This is the original description:—

The same remarks (*e.g.*, that it might perhaps be given specific rank if full material were available) apply to another Eucalypt, a variety of Bloodwood, of which the fruits are of a more fleshy nature than any of the gums with which I am acquainted. I purpose, when specimens are available for the purpose, describing it under the name *E. terminalis* var. *carnosa*. My first specimen I obtained about twenty-five years ago on the Darling Downs (branchlets with unripe fruit), after which I received specimens with unripe fruit from Mr. Edgar, Rockhampton, and recently from Mr. Pagan, from trees growing near the Central Railway Line, 74 miles from Rockhampton. The fruits on these were also unripe.

I have seen one of Mr. Bailey's specimens (One-tree Hill, near Gowrie, Darling Downs, Queensland). The supposed variety being merely an unripe condition of the normal fruit, cannot stand.

RANGE.

Mueller, in the original description, gives the vague locality, "In meadows and dry fertile plains of intra-tropical Australia." In the absence of such information in the original description, where we have a right to expect it, we must seek it elsewhere. It is doubtless to be obtained in the "Flora Australiensis," iii, 257. It is well known that Mueller sent his material to Bentham, to enable him to prepare the work in question, and "Arnhem's Land and Gulf of Carpentaria, *Mueller*," represent the type. In other words, it originally came from the Northern Territory including (probably) the western shore of the Gulf of Carpentaria.

Bentham adds the following localities from Queensland. "Albany Island, *W. Hill*; Curtis and Gloucester Islands, *W. Henne*; Edgcombe Bay and Rockhampton, *Dallachy*, also *Bowman*; Endeavour River, *Banks* and *Solander*."

In Mueller's First Census he confined *E. terminalis* to "North Australia" (meaning Northern Territory, in this case), South Australia and Queensland. In the Second Census he added Western Australia and New South Wales.

Its range, so far as I know, is in the drier parts of all the mainland States, except Victoria and South Australia. As regards the latter State, it has already been recorded from near its northern boundary. It occurs in the northern half of the continent; in New South Wales as far south as the Gwydir River, practically from south to north

of Queensland, then westerly in the greater part of the Northern Territory and into North-west Australia. It should be looked for in extra-tropical Western Australia. Like other Bloodwoods, it is generally found in poor sandstone country.

NEW SOUTH WALES.

The species has not been collected, so far as I know, south of the Gwydir River and the Moree-Inverell Railway line, in northern New South Wales. I do not know the boundary line, or the amount of overlapping, between the territory of this species and *E. pyrophora*, in north-western New South Wales.

Buds and flowers, Warialda (Henry Deane, E. J. Hadley, W. A. W. de Beuzeville). Bloodwood, red wood, Warialda, 4-6 miles on the Inverell-road (J.H.M. and J. L. Boorman). Elongated fruits.

"Bloodwood up to 3 ft. 6 in. in diameter and 90 feet high. On sand ridges between 40 and 50 miles north-west of Collarenebri (Sid. W. Jackson).

QUEENSLAND.

In this State I record it from the Roma district, on the Western Line, thence in coastal and central districts as far north as the Cape York Peninsula and the Gulf of Carpentaria. We want more records from Western Queensland localities, and we want some from the vicinity of the New South Wales-Queensland border.

The most southern specimens are on the Western Railway line, as follows:—

Roma (E. W. Bick). Rather large, scaly corky, high-shouldered fruits. Roma, with scurfy buds of a reddish tint, like Mornington Island specimens (Joseph Mayfield).

It is not rare in the Eidsvold district (west of the Maryborough-Gayndah line), where it has been collected by Dr. T. L. Bancroft, *e.g.*, from Dwyer's road, and the road to Spring Gully. Dr. Bancroft, in addition to botanical specimens, has also sent excellent photographs of the trees.

We now come to the Central Railway line and thereabouts.

Mt. Morgan (C. F. Henrickson). (Specimens mixed with *E. dichromophloia*). Fruits only, winged seeds. Rockhampton (P. A. O'Shanesy). Labelled *E. terminalis* by Mueller. (Similar to A. Murphy, No. 12, north of Rockhampton, see below.) "A good-sized tree, of crooked habit, bark dark, persistent throughout. This is known amongst bushmen as 'Bloodwood Gum.'" Common, Rockhampton (P. A. O'Shanesy, No. 67). (Labelled *E. terminalis* by Mueller.) "Flowers white, in bunches, beautiful in bud. No seed. Bark thick, rough at base of tree, smooth towards the top. Colour very dark. Growing near the Vine." (I do not understand the allusion.—J.H.M.) Rockhampton (J. Dallachy, No. 399). (Labelled *E. terminalis* by both Mueller and Bentham.) In flower only, buds reddish. Rockhampton (J.H.M.). Yeppoon (J. L. Boorman). Rather large, high-shouldered fruits. Precisely the same as those from Roma, an interior locality. "Bloodwood," dark red timber. North of Rockhampton (A. Murphy, No. 12). Longish fruits, high-shouldered to scarcely urceolate. Sucker leaves pedunculate, glabrous, not in earliest stage. Same as Roma.

"Bloodwood," Duaringa, 66 miles west of Rockhampton (J.H.M.). In flower only. Wallaroo, 78 miles west of Rockhampton (J.H.M.). In flower only.

"The common Bloodwood of the district. Grows to about 30 feet high, comparatively small stems of about 2 feet in diameter; bark scaly. Tips of branches pale coloured." Seeds winged. Emerald, 166 miles west of Rockhampton (J. L. Boorman). Mitchell's Pinch, between Mantuan Downs and Springsure. Seeds winged (F. M. Bailey). Gadwall, Alpha, 273 miles west of Rockhampton (G. T. Wood).

We now come to the Northern Railway.

Townsville (R. H. Cambage, No. 3798).

A second rather larger Bloodwood tree (*E. terminalis*?) [the query may be removed, in my view.—J.H.M.], Nos. 3906 and 3908, occurs at Alma-den, which I have referred to in these notes simply as Bloodwood, and it was noticed over practically the same range as the Red Bloodwood (*E. dichromophloia*), but with this difference in location that, while the latter favoured the elevated land, the former as more often found on the fairly siliceous flats and in the valleys. (R. H. Cambage, *Proc. Roy. Soc. N.S.W.*, xlix, p. 409, 1915.)

Bloodwood keeps to the low land on granite, Alma-den. (R. H. Cambage, 3906.)

We are now approaching the Cape York Peninsula and the Gulf of Carpentaria.

Bloodwood, Georgetown (R. H. Cambage, No. 3908). Bloodwood, Croydon (James Gill).

Mornington Island, Gulf of Carpentaria. Scurfy buds of a reddish tint (E. W. Bick).

We are now at Cape York Peninsula, still going north.

Walsh River (correspondent of F. M. Bailey). Palmer River (Dr. W. E. Roth, through C. T. White). Mitchell River, Gulf of Carpentaria (E. Palmer). Named *E. terminalis* by Mueller. See *Proc. Roy. Soc. N.S.W.*, xvii, 1883. See above, p. 206. Thursday Island (correspondent of F. M. Bailey). With raised lines on calyx-tube.

NORTHERN TERRITORY.

"Smooth-barked Bloodwood, a common species near Darwin, characterised by soft hairy sucker shoots, straight clean stems, good timber. It is difficult to find good examples in the near vicinity of Darwin now, the good trees having been cut out years ago and replaced by a growth of scrub. Further out of town there are numerous examples on the well-drained ironstone ridges. I have never seen a tree in flower, though I have looked out for one (Dr. Jensen). The seed capsules are not often found under the trees, a fact accounted for by the heavy rains washing the capsules away, and by annual grass fires. Capsules are scarce indeed. No. 425, on the other hand, bears most profusely and regularly.

"Fine flaky bark at base, limbs smooth, whitish, suckers pinkish, hairy, changing to smooth very early. Sucker leaves broad, mature leaves narrow. Trunk marked with dirty flecks. Large tree, grows usually on dry gravelly ridges. Durable timber. Stem very straight and free from branches." Darwin (Dr. H. I. Jensen and G. F. Hill, No. 398).

The timber of a sapling is somewhat pale coloured, and not very deep red; the inner bark reddish. Certain galls (caused by *Cystococcus* sp.) are, Mr. Hill says, characteristic of this species.

Another specimen, smooth-stemmed Bloodwood. Darwin (G. F. Hill, No. 398), has suckers (in a later stage) glabrous, pedicellate, broad-lanceolate. Fruits same as Cambage's 3908 (Georgetown).

Near Rifle Range at Darwin. Bark more or less flaky and typical of all the same species here. Deep red timber (G. F. Hill, No. 425). "Bloodwood," medium-sized tree, rough bark on trunk and branches. Darwin (G. F. Hill, No. 343). Long narrow fruits; large flowers, white calyces.

"Rough-stemmed Bloodwood. Rough bark throughout. Tree of erect growth, straight stem durable timber. Terminal branches slender and drooping." 30 miles south-east of Darwin (G. F. Hill, Nos. 365, 366). Long narrow fruits.

Lanceolate pedicellate sucker leaves (not in the earliest stage, but still opposite). Long narrow fruits. Bathurst Island (G. F. Hill, No. 470).

Port Darwin (N. Holtze). Large tree, scurfy buds, 10 miles from Darwin, on red ironstone lands (C. E. F. Allen, No. 137). Port Darwin (correspondent of Mueller). Pine and Horse-shoe Creeks (E. J. Dunn). Between Bull Oak Creek and Crescent Lagoon (Prof. Baldwin Spencer).

Baie Raffles. Côte N. de la Nouvelle Hollande, Voyage de l'Astrolabe et de la Zélée, 1838-40. M. le Guillou No. 64 (Herb. Paris).

I am satisfied that the Northern Territory specimens just enumerated are very close to the type of *E. terminalis*. Also that the contrast of rough-stemmed and smooth-stemmed bark is a matter of age of the tree. The bark is always more or less flaky, and the outer, rough flakes fall off and show a relatively smooth, reddish brown, new surface. Further, in saplings the timber is somewhat pale, but in mature trees the colour is deep red.

To summarise, the earliest juvenile leaves and rachis are slightly hairy scabrous, and the former ovate-circular in shape. The peduncles and pedicels are long, and sometimes thick. The buds are scurfy, the fruits are oblong, and the seeds have long wings.

The following specimens from the southern part of the Territory were noted or collected by the Horn Expedition. I have not been able to see them, and would like to compare them with *E. pyrophora* Benth.

In the leader's Report at p. 33, we have "Camp 31, 15th June, 1894, James Range, Glen Edith (? Laurie's Creek). 'Native Fig' (*Ficus orbicularis*), Cypress Pine (*Callitris*), and Bloodwood Gum (*Eucalyptus terminalis*) grow in the interstices of the rocks near the water."

In the Report on the Horn Expedition, Botany (Prof. Tate), p. 159, we have under *E. terminalis*, "Hermannsburg (Kempe), widely distributed, chiefly on rocky declivities and tablelands, Tempe Downs to George Gill Range, Mereenie Escarpment to Mt. Sonder, and Stuart's Pass, Mt. Gillen to James' Range."

Capt. S. A. White, speaking of the Macdonnell Ranges, says it is a widely distributed species, growing chiefly on rocky slopes and table-lands (*Proc. Roy. Soc. S.A.*, Vol. xxxviii).

WESTERN AUSTRALIA.

Mr. W. V. Fitzgerald's remarks are: "Tree, 40-80 feet, trunk to 40 feet, diameter 1-2 feet, bark persistent on stem and branches, dark-coloured, rough, longitudinally fissured; timber red, tough and fairly hard; buds glaucous; filaments pale yellow. The 'Bloodwood' of North-west Australia. When in bloom a favourite resort for flying foxes."

"On the plains and frequently sparsely covering the basaltic hills, Bloodwoods (*E. terminalis* and *E. pyrophora*) prevail (with *E. microtheca*) often forming open forests of fair extent, the species ultimately extending to the coast." (Fitzgerald's Kimberley Report, p. 11.)

Following are individual specimens which I have seen, and they are all very near the type.

Roebuck Bay (J. W. O. Tepper, No. 278). Goody Goody, near Derby (W. V. Fitzgerald, No. 301). Also Derby. Base of Mt. House, Kimberley West (W. V. Fitzgerald, No. 970). Broome (W. V. Fitzgerald, No. 131), labelled *E. terminalis*.

"A specimen in fruit only from Careening Bay, on the N.W. Coast, *A. Cunningham*, resembles this (*E. terminalis*) rather than *E. pyrophora*." (B.Fl. iii, 257.)

AFFINITIES.

1. With *E. corymbosa* Sm.

As *E. terminalis* has been such a misunderstood species, it may be necessary, in order to trace individual specimens which have passed under this name, to refer to other species of the Corymboseæ, e.g., *E. corymbosa*, *E. dichromophloia*, and *E. pyrophora*. Mueller wavered a good deal in regard to his own species, and I give some of his observations, arranged in order of date.

(1) Following is a translation:—

E. terminalis is a smaller tree (than *E. Abergiana* and *E. corymbosa*), with the bark as (Bowman noted) more deeply reddish. At the Paroo River it grows bigger, according to a specimen of Woolls's. [This is *E. pyrophora*.—J.H.M.] At Port Darwin there occurs a variety with pedicels a line thick; this in most points differs from *E. Abergiana*, as also from *E. corymbosa*; moreover, the leaves are paler, of the same colour on both sides, scarcely spreading horizontally but rather vertically; they give a different appearance to the tree, and the same may be said of *E. dichromophloia*. *E. pyrophora* (whose stamens, however, are not fiery-orange as are those of *E. miniata* and *E. phœnicea*) is a form of *E. terminalis*. (Fragm. xi, 42.)

It will be seen that Mueller's view here is that *E. dichromophloia* and *E. pyrophora* are forms of *E. terminalis*.

(2) In the wide tracts of intra-tropical Australia *E. terminalis* with its varieties occurs even far inland, thus at the Bareeo (Dr. Wuth) and at Lady Charlotte's Water (E. Giles) (*E. pyrophora* Benth.), in such hot and arid regions, as are climatically vastly different from the cool forest-ravines of the south-east coast [this can only refer to typical *E. corymbosa*.—J.H.M.]; hence gradually the leaves become paler, nearly or fully as much on the upper surface as beneath, their position gets more vertical and therewith stomata occur also on the upper page, the panicles also assume often a paler hue, the flowers and fruits generally are smaller, the latter becomes less woody and somewhat more slender, and often lose the outward curvature towards the rim; but the fertile seeds of *E. terminalis* are as a rule provided with a terminal membranous appendage of about the length of the kernel, a characteristic hardly ever occurring in the typical *E. corymbosa*.

An extraordinary variability is also evinced by *E. terminalis* as regards not only the size of its calyx, but also the manner of its dehiscence, a regular sutural line being sometimes not traceable, necessitating an irregular defraction of the opercula summit; the lid moreover verges sometimes to a flattened form with an almost obliterated apex, or the lid may be quite turgid and its apex very prominent. ("Eucalyptographia," under *E. corymbosa*.)

He states that the seeds of *E. terminalis* are, "as a rule," winged, while this "hardly ever" occurs in *E. corymbosa*. I am dealing with the seeds separately. He also refers to the tearing of the operculum in *E. terminalis*. I shall deal separately with this character in the Corymbosæ.

Mueller ("Eucalyptographia," under *E. corymbosa*) speaks of the suggestion that *E. terminalis* might be a synonym of *E. corymbosa*, as "almost confirmed." Luehmann found it impossible to draw a clear line of demarcation between them. (*Proc. Aust. Assoc. Adv. Science*, vii, 526.) Yet, as has already been stated, Mueller recorded the name *E. terminalis* in his Census.

The differences between the two species may be stated as follows. (Compare Plates 160, 161 for *E. corymbosa*, and Plates 164, 165 in the present Part.)

<i>E. corymbosa.</i>	<i>E. terminalis.</i>
<i>Branches</i> erect, robust, reddish, and usually angular.	Slender, terete and for the most part pendulous, dull or pale coloured as well as the leaves.
<i>Juvenile leaves</i> .—Ovate, glabrous or nearly so ...	Similar in shape, perhaps thinner, and more hairy as far as seen.
<i>Mature leaves</i> .—Broadly-lanceolate, acuminate, or ending in a long point. Broader than <i>E. terminalis</i> .	Linear-lanceolate to narrow-lanceolate, acute or shortly acuminate.
<i>Buds</i> .—Glabrous	Scurfy.
<i>Operculum</i> .—Acute, sometimes the point very long	Blunt. Usually tears on being removed from the calyx-tube.
<i>Fruits</i> .—Broadly urceolate to broadly ovoid, the smaller forms globose urceolate.	Pale-coloured, narrow oblong truncate, sometimes oblong urceolate, $\frac{1}{2}$ to above 1 inch long.
<i>Seeds</i> .—Angular or with small wings	Flattish, with long wings.

2. With *E. pyrophora* Benth. See page 325.

3. With *E. dichromophloia* F.v.M. See page 319.

DESCRIPTION.

CCXVII. *E. dichromophloia* F.v.M.

In *Journ. Linn. Soc.* iii, 89 (1859).

FOLLOWING is a translation of the original:—

A tree, with somewhat terete branchlets, *leaves* alternate, moderately petiolate, somewhat thick, falcate or elongate-lanceolate, narrowed into a long point, not shiny, faintly veined, imperforate, *umbels* paniculate, 5-7 flowered, peripheral vein close to the margin, *partial peduncles* angular, longer than the *pedicel*, *buds* ovate, the same length as the pedicel. *Calyx-tube* slightly longer than the hemispherical rounded *operculum*. *Fruit* urceolate-ovate or subglobose, ecostate, quadrilocular, valves deltoid, deeply included, seeds fertile, winged.

Found in the less fertile or sterile parts of Australia, everywhere intra-tropical. Flowers in April and May.

A moderate-sized or large tree, the top layer of the bark smooth and subpapyraceous, cinereous, slowly breaking away from the interior red portion. *Leaves* 3-8 inches long, 6-12 lines broad. *Peduncles* 4-8 lines long. *Pedicels* angular. *Flowers*, not yet opened, 3 lines long. *Fruit* 4-6 lines long, slightly contracted; capsule finally coming away from the calyx-tube.

This lack of adnation of capsule to calyx-tube, while not characteristic, is well developed in this species.

Bentham (B.Fl. iii, 257) described the species as follows:—

A moderate-sized or large tree, the bark smooth, ash-grey, at length separating from the inner reddish bark (*F. Mueller*). *Leaves* in the imperfect specimens very long lanceolate, narrow, thick with numerous, very fine, close, parallel veins, the intramarginal one scarcely distant from the edge. *Umbels* several-flowered, forming loose, terminal, corymbose panicles. *Young buds* obovoid, with a very short obtuse operculum; *perfect flowers* unknown. *Anthers* of *E. corymbosa*. *Fruit* urceolate-globose, with a contracted neck, smooth, attaining sometimes $\frac{1}{2}$ inch diameter, but mostly much smaller; the rim thin, the capsule sunk. *Perfect seeds* broadly winged on one side.

Mueller did not figure *E. dichromophloia* in his "Eucalyptographia," but he enumerated the species in both his First and Second Census, in spite of Luehmann's note to me: "Baron von Mueller did not consider *E. dichromophloia* as a species, and was doubtful even of *E. terminalis*." This is simply evidence of the difficulty Mueller experienced in separating the species in question from others.

Note that Mueller originally described the "top layer (presumably the outer layer) of the bark as smooth and subpapyraceous, cinereous, slowly breaking away from the interior red portion." Mr. R. H. Cambage, at p. 316, has referred to the red bark in this species. Mueller's use of the term subpapyraceous, would indicate transition in

texture between the ordinary Bloodwood barks and those "micaceous" barks of *E. miniata* and *E. phænicea*. The difference in colour of the bark, disclosing the "inner red portion" is noted in the specific name.

The fruit, according to the original description, may be urceolate, ovate or subglobose, 4-6 lines long and slightly contracted. Some fruits from the Roper River, a type locality, may be purplish, ovate to urceolate, rim thin, reminding one of a bird's egg. Such fruits, which are dainty and ornamental in appearance, with very slender pedicels, have been received from as far south as Rockhampton.

On the other hand, particularly in Queensland, the fruits of this species may be as large and as urceolate as ever seen in *E. corymbosa* (e.g., Plate 165, figs. 12 and 11), but they are always thin-walled, smooth, and with a not easily defined "daintiness" which seems to differentiate them from the fruits of all other species.

RANGE.

The original description merely says "less fertile or sterile parts of Australia, everywhere intra-tropical." We know, however, that Mueller got his specimens on the Gregory Expedition of 1856, and on turning to the "Flora Australiensis" (iii, 257) we find that they were collected at the Abel Tasman, McArthur (Macarthur) and Roper Rivers, in the Northern Territory. These three rivers flow into the west coast of the Gulf of Carpentaria, the Roper being the most northerly, followed by the Macarthur and the Abel Tasman.

The Fitzmaurice River, where Mueller also collected it, is also in the Northern Territory, but flows into Cambridge Gulf, near the Western Australian boundary.

Bentham adds "Islands of the Gulf of Carpentaria, *R. Brown*." These are probably the group opposite the Macarthur River.

We have traced it, with broad gaps, over the north of Australia, mostly at the tropic, both in Queensland (Eidsvold and Rockhampton) and Western Australia (Murchison River), North Australia and Northern Queensland. Its range under each State is separately stated.

NORTHERN TERRITORY.

The type comes from the Territory, and it has already been found east (rivers flowing into the Gulf of Carpentaria) and west (Fitzmaurice River) of the northern part of it. It is also not rare in the Macdonnell Range and the surrounding country. As time goes on, we shall find additional localities.

Many years ago the late Mr. J. G. Luehmann, then in charge of the Melbourne Herbarium, gave me the following fragmentary specimens:—

a. Leaf (loose), immature buds, fruits and seeds. (Mueller, Roper River.) These are figured, and I look upon these as belonging to the type. The fruits are thin-walled, spotted or mottled, and remind one irresistibly of a bird's egg.

b. Leaf (loose), immature buds, fruits. (Mueller, Fitzmaurice River), and I look upon these as belonging to a co-type.

The principal observable difference between these two specimens lies in the fruits. Those of (*b*) are smaller and greener, but both lie between the 4-6 lines of the original description.

Further specimens from the Roper River and one belonging to the Abel Tasman River are referred to below, p. 342.

"On slopes of schisty hills I have collected what I have provisionally called a narrow-leaved form of *E. latifolia*. *E. latifolia* (357) had rough bark all the way (see also 411). This form has smooth bark, excepting a little roughness at the base." Woolgri and other near localities (Dr. H. I. Jensen, Nos. 409, 421).

Umbrawarra (Dr. Jensen, No. 410).

Dean's Camp, Burrundie (Dr. Jensen, No. 428). "White-barked, small crooked Hill Gum. White smooth bark, peeling in patches." Juvenile leaves, Burrundie (Dr. Jensen, No. 361). The material of No. 361 is very scanty, and therefore not perfectly satisfactory. The only juvenile leaves available in this species.

All Dr. Jensen's specimens are from the same general locality. His specimens are specially interesting as regards the fruits. The fruits of Nos. 361, 409, 421, 428, are small, like those of the Fitzmaurice River. They are spotted. Those of 410 are like those of the thin-walled Roper River type, and there are some as small as those of the Fitzmaurice River. In these specimens the two forms seem to combine.

It is also found at Finke River, Macdonnell Ranges, with Chinese white calyces (Rev. H. Kempe). Compare Persieh, Endeavour River, Q.

In Ewart and Davies' "Flora of the Northern Territory," p. 313, I tentatively referred the following to *E. terminalis* F.v.M. in the following words:—

"The following specimens are identical with specimens included by Mueller under the above species, but the Corymbosæ are under revision.

"808. Sandstone Ranges between Bauhinia Downs and Tanumbirini, 20th March, 1912. Smooth white stem, rusty near ground. Leaves, buds, flowers.

"120. Macdonnell Ranges, 23rd March, 1911. Leaves, buds, flowers. Near a form formerly named *E. polycarpa* F.v.M."

I am now of opinion that these two specimens are *E. dichromophloia*.

QUEENSLAND.

It is known in the Eidsvold district, then, going north, from Rockhampton and in the dry country more than 200 miles to the west, to west of Cairns and the Gulf Country, and thus well on the road to the type locality in the Northern Territory.

It is not rare in the Eidsvold district, *e.g.*, Spring Gully and the vicinity of the Old Battery (Dr. T. L. Bancroft).

The following are in the Rockhampton district and west of it.

(a) Rockhampton (P. O'Shanesy, No. 60, series 4th). Twigs with fruits. Labelled *E. terminalis* by Mueller. Has the thin-shelled, purplish spotted fruit characteristic of *E. dichromophloia* (Roper River).

(b) Mount Morgan, with fruits as large as I have seen in the species (C. F. Henrickson). See fig. 12, Plate 165.

(c) Capella, 198 miles west of Rockhampton (M. Nagle). Fruits near type.

(d) Red-barked Bloodwood. On mixed sand and shale soil. Bogantungan, 220 miles west of Rockhampton (R. H. Cambage, No. 4160, with a photograph of the bark).

E. terminalis F.v.M. Very like the Bloodwood in habit but it is never so fine a tree. The bark is more scaly and of a pale red colour, and the trees cluster together more. It is, as the bushmen call it, more "patchy." Sometimes you may journey for a day or so without seeing it, and then you may have it in sight all round for many miles. It has a very wide range; I think I first noticed it on the edges of Brigalow scrubs near the Comet River, north of that I think I have seen it in places all through Eastern Australia. The natives about the Dawson call it "A-rang-mill." The wood would be of some value were it not always so small. (Tenison Woods, *Proc. Linn. Soc. N.S.W.*, vii, 333.)

R. H. Cambage thinks that it is *E. dichromophloia* that is referred to.

Bloodwood, with bark of a decidedly red cast, broad leaves, young crinkled fruit. Charters Towers (H. B. Walker).

Following are in the Townsville district :—

"Bloodwood," Reid River, near Townsville, nearly (Nicholas Daley through G. R. Shelton). Departing a little from the Chillagoe specimen, becoming a little scaly. Numerous small flowers; fruits largish, purplish, spotted.

Townsville (R. H. Cambage, No. 3803). Fruits much spotted. "Bloodwood, locally considered to be *E. corymbosa*." Stannary Hills (Dr. T. L. Bancroft). Flowers only, no fruits.

Following are from the Cairns district :—

Red-barked Bloodwood on ridges. Granite, Alma-den (R. H. Cambage, No. 3909. Bark said to be same as No. 4160). "Gum-topped Bloodwood." Foliage only and also fruit. "Bloodwood." Twigs in fruit. Both the same. Chillagoe (E. Doran). With smallish, graceful, thin-rimmed, smooth urceolate fruits.

Walsh River (correspondent of F. M. Bailey). Walsh River (T. Barelay Millar, through C. T. White). Red cast of buds marked in these specimens.

Following is the best account yet written of the distribution of this species in Queensland :—

The species of *Eucalyptus* (Nos. 3069 and 4160), which I have referred to in these notes as Red Bloodwood, because of the reddish, rusty colour of its flaky bark, has so far not been definitely identified, though it is a common tree in the siliceous soils of the forests of tropical Queensland, and is probably *E. dichromophloia* F.v.M. [Since confirmed.—J.H.M.] It usually occurs on ridges and hill slopes but seems to avoid rich alluvial flats, though it was noticed on some gravelly low land. It has a somewhat flaky reddish bark all over the trunk, while the branches are usually smooth and often pale red. The fruits as examined over a very wide area, are urceolate, from about 1.2 to 1.5 cm. long, by 9 mm. to 1.2 cm. in diameter, with thin rim slightly expanded at the orifice to about 5 to 7 mm. across, and slender pedicels of about 4 to 5 mm. long. The seeds terminate in a wing or samara 4 to 5 mm. long, by 2 to 3 mm. broad. The timber is reddish-brown. Neither flowers nor buds were procured.

The species was seen at intervals most of the way from Mareeba to Normanton, where it is growing near the artesian bore in the town; also on the Cretaceous sandstone ridges near Donors Hills on the road to Cloncurry. Specimens of this species were collected at Prairie, east of Hughenden, and at Begantungan, about 220 miles west of Rockhampton. The species showed practically no variation over the whole of the area in which it was examined, and in some respects agrees with the description of *E. terminalis* F.v.M., except that the fruits of the latter are described as slightly longer and less urceolate.

There is apparently no question but that this Red Bloodwood is the species referred to by Leichhardt as Rusty-gum. On page 21 (Overland Expedition) he writes that when on clayey sandstone country on Dogwood Creek, south of the Dawson River, he found "A new gum-tree with a rusty coloured scaly bark, the texture of which, as well as the seed-vessel and the leaf, resembled bloodwood, but specifically different." Rusty Gum at p. 48 (J.H.M.). He again refers to it when on Stephen's Creek (p. 139), and writes :—"A rather stunted rusty gum grew plentifully on the sandstone ridges." It was again noted (p. 195) near the Cape and Suttor Rivers, and (p. 304) below the junction of the Lynd and Mitchell Rivers, also (p. 355) near the Leichhardt River, and "on sandstone ranges" (p. 460) beyond the Roper River, and last (p. 526) near Port Essington." (R. H. Cambage in *Proc. Roy. Soc. N.S.W.*, xlix, p. 48.)

I have a label in Leichhardt's handwriting (the specimen seems to have disappeared), "The Bloodwood. Rusty Gum, with reddish scales, Burdekin," which I take to be this species.

Endeavour River, buds and flowers, calyces Chinese white (W. Persich).

WESTERN AUSTRALIA.

It occurs from the Murchison River northerly to the Northern Territory.

"*Eucalyptus terminalis*. Timber of no use, at any rate not in this district, but it grows in the driest soils." Mt. Narryer, Murchison River (Isaac Tyson per R. Helms). The name was furnished by Mueller or Luehmann. Narrow sparse foliage and fruits, winged seeds, flowers, and red buds. The fruits variable, varying from nearly globular (like Mt. Augustus) to nearly a typical *terminalis* shape. It seems to be nearer to *E. dichromophloia*, but is not typical.

Leaves short and narrow. Fruit a little larger and more globose than the type, but smaller than some Queensland fruits. Seeds very winged. Summit of Mt. Augustus (J. Forrest, 1883). Mt. Augustus (3,480 feet) is in lat. 24° 21' and long. 116° 56' E. Labelled *E. terminalis* by Mueller, but referred to as "a variety with narrow leaves and short fruits," in "Plants indig. around Shark's Bay and its vicinity." Mueller, 1883, p. 14. See fig. 14, Plate 165.

Between Globe Hill and Naroo and between Nanutarra and Globe Hill, Ashburton River (A. Morrison). Long leaves of medium width, young fruits, ripe fruits with slightly recurved rims. These specimens resemble in a striking manner a drawing of two specimens at Kew, already referred to, one in young bud, labelled "Abel Tasman" and a second in fruit labelled "Roper River, Dr. M. [Mueller], 1857," and both also labelled "*Eucalyptus dichromophloia* Ferd. Mueller" (in Mueller's handwriting), and evidently co-types. It is evident that the fruits of the species at the Roper River display variation, for these are thinner, smaller, and less delicate than others from the same locality referred to at p. 315.

Roeburne (J. W. O. Tepper), reddish buds, flowers and narrow leaves only. (E. Pritzel, No. 281, as *E. terminalis*.) "Angophora-like, leaves thick, rigid, very white trunk." Poondina, near Port Hedland (Dr. J. B. Cleland). Fruits only.

"Low, roughish bark, bears very large galls." (Presumably *Brachyscelis pomiformis* Froggatt). Port Hedland-Marble Bar track (Dr. J. B. Cleland). Fruits only, not quite ripe. These two specimens are identical.

Broome (W. V. Fitzgerald, Nos. 132, 138, 150, 166). In flower, buds reddish. Also C. H. Ostenfeld, No. 527; in fruit.

Base of Mt. House, West Kimberley (W. V. Fitzgerald, No. 961, labelled *E. pyrophora* Benth. by Mr. Fitzgerald). Fruit only, a little larger than the Port Hedland specimens. Leaves broadish, fruits, and with a large spherical gall (*Brachyscelis pomiformis* Froggatt). Near Grace Knob (W. V. Fitzgerald, No. 885, labelled *E. pyrophora*). Broad leaves, usual spherical gall. Between King Island and Exmouth Gulf (Dr. H. Basedow). Aboriginal name of gall forgotten. "Edible inside, sweet like a miniature coconut." Broad leaves, large white roundish buds. All these three alike.

Derby, broad leaves, fruit (C. H. Ostenfeld, No. 525).

The last four specimens have broad, coarse leaves and comparatively large fruits. Their facies is very different to that of the type, but there seem to be imperceptible gradations.

This Bloodwood gall, *Brachyscelis pomiformis* Froggatt, originally came from near King Sound, N.W.A., on *E. perfoliata* R.Br. I also found it on *E. tessellaris* at Bundaberg, Queensland, so that it will probably be found on other Bloodwoods.

Goody Goody, near Derby. Reddish buds and young crinkled fruit (W. V. Fitzgerald, No. 302).

Red cast of buds. Short thick style. Reddish buds; flowers, one loose fruit. Near Mt. Marmion, West Kimberley (W. V. Fitzgerald, No. 507). Isdell Range, West Kimberley, at E. 88. Pale buds (W. V. Fitzgerald, No. 1238).

Wyndham. Two specimens, varying in width of leaves and size of buds, which are pale. One loose fruit (A. E. V. Woodroffe). East Kimberley. Reddish buds; flowers (R. Helms).

Speaking of the North-western Australian tree, Mr. W. V. Fitzgerald (MSS.) says :—

“ A tree of 40–50 feet; trunk to 25 feet, diam. 1–2 feet; bark of the trunk grey, roughish, falling off in small plates, leaving the bark smooth, white or white blotched with grey; sometimes the outer bark persists for a few feet above the ground; branches spreading; timber reddish to brownish, tough and fairly hard; filaments white.”

AFFINITIES.

1. With *E. latifolia* F.v.M.

Dr. Jensen considered *E. dichromophloia* as a narrow-leaved, smooth-barked form of *E. latifolia*, which gives a point of view. I will deal with this affinity when I come to *E. latifolia* in Part XLI.

2. With *E. corymbosa* Sm.

“ *E. dichromophloia* has the flowers considerably smaller, about the size of *E. trachyphloia* and *E. latifolia*, besides the bark seems always different, as the specific name implies, from that of *E. corymbosa* and *E. terminalis*, its upper thin smooth and pale stratum separating from the brownish-red thick layers below.” (“*Eucalyptographia*” under *E. corymbosa*.)

As far as size and shape are concerned, the fruits, and therefore the inflorescence, of *E. dichromophloia* (e.g. Mount Morgan) are not to be distinguished from the normal urceolate fruits of *E. corymbosa*, but the rim is thinner, even in the large-fruited forms. The typical fruits of the two species are very different. The seeds are different, and so are the seedlings.

3. With *E. terminalis* F.v.M.

In describing *E. dichromophloia*, Mueller does not indicate its affinities. He indeed, as years rolled on, appeared to be uncertain about the species. Like other busy botanists, he sometimes named from memory, and often named *E. dichromophloia* “*E. terminalis*,” and his example has been followed by others, as the specimens so casually named became distributed. Bentham says: “It appears to differ but slightly from *E. terminalis* in the shape and size of the fruits, and perhaps in the bark.”

As a matter of fact, *E. dichromophloia* is more remote from *E. terminalis* than it is from *E. corymbosa*.

Compare Plates 164 and 165. The fruits of *E. dichromophloia* are smaller, are (usually) more urceolate, and far less coarse, woody and cylindroid than are those of *E. terminalis*. The pedicels of *E. dichromophloia* are slender, and the fruits often shiny and less scurfy than are those of *E. terminalis*.

Typical *E. terminalis* usually occurs in flats and valleys, while *E. dichromophloia* (often called Red Bloodwood) prefers more elevated land.

4. With *E. pyrophora* Benth. See page 325.

DESCRIPTION.

CCXVIII. *E. pyrophora* Benth.

In B.Fl. iii, 257 (1866).

FOLLOWING is the original description, supplemented only by the key in B.Fl. iii, 199 :—

Nearly allied to the preceding four species (*corymbosa*, *citriodora*, *terminalis*, *dichromophloia*) but apparently to be distinguished, unless all be considered as forms of *E. corymbosa*. Leaves long, narrow, and thicker than in any of them. Inflorescence the same. Buds obovoid-pear-shaped, the very obtuse operculum undistinguishable from the calyx-tube till it separates, and then often tearing off irregularly. *Flowers larger than in E. terminalis*, the calyx-tube very broad and open, varying from 4 to 6 lines diameter. Stamens of the allied species. Fruit globose or slightly ovoid, contracted at the orifice, without a distinct neck, the rim thin, the capsule sunk. Seeds apparently winged, but not seen perfect.

This is one of the coarsest species of the *Corymbosæ*, a single corymb being quite heavy in weight, and almost succulent. The flowers are large, the pedicels and peduncles heavy, and the fruits correspondingly heavy and solid. The rachis and inflorescence generally (calyx-tube and buds) uniformly dull yellow.

It has been one of the objects of my life to ascertain the types of as many Australian plants as possible, and this work cannot be attended to too soon. I have had a good deal of trouble with this species, as it is probable that the original specimens were scanty, while they have certainly been broken up, scattered, and, in Australia, disarranged.

Looking at Bentham's description of the species, we find he speaks (in the Key) of "fruit globular or ovoid, contracted at the mouth," of "flowers larger than in *E. terminalis*, . . . buds obovoid-pear-shaped . . . operculum very obtuse." For localities he enumerates—

1. Nichol Bay (Gregory).
2. Upper Victoria R.
3. Depot Creek (Mueller).
4. "Also with rather smaller flowers" Depuech Isd. (Bynoe).

I have seen specimens, more or less satisfactory, of Nos. 1 and 2. Of these, only No. 2 strictly complies with the description as far as the material goes. Of No. 2 we have a copy of a label in Mueller's handwriting in Herb. Melb.—"*Euc. terminalis* (*pyrophora*), Upper Victoria River, Mueller, 1856."

The specimen has large, rounded, rusty buds, and Mueller evidently originally placed it with his *E. terminalis*, but Bentham afterwards founded *E. pyrophora* (partly) upon it. It seems different from the Nichol Bay specimens (No. 1).

Of this No. 1 I have two specimens, both probably identical, viz:—

(a) "*Euc. terminalis* F.v.M. (*pyrophora* Benth.), Nichol Bay."

(b) "*Euc. polycarpa* F.v.M., *Euc. pyrophora* Benth., Nichol Bay, Mueller."

The above labels are in the Melbourne Herbarium in Mueller's handwriting. They appear to be identical with the Port Hedland and Ashburton River specimens, and therefore, in my view, belong to *E. dichromophloia* F.v.M. See p. 318.

Now let us consider a form which I look upon as a variety of *E. pyrophora*.

VARIETY.

Var. *polycarpa* var. nov.

Synonym.—*E. polycarpa* F.v.M. *Journ. Linn. Soc.* iii, 88 (1859).

Following is a translation of the original description:—

A tree, branches somewhat terete, rigid, leaves alternate or sub-opposite, somewhat shortly petiolate, elongate or falcate-lanceolate, narrowed into a long point, shining, imperforate, thickly and faintly pinnaveined, a little paler on the underside, the peripheral vein rather close to the margin. The terminal umbels in a broad panicle of 4-6 flowers, the partial peduncles a little longer or twice as long as the pedicels, and terete like them. Fruit oblong ovate, truncate, exangular, ecostate, gradually contracted at the mouth, obtuse at the base, 3-4 celled, several times longer than the pedicel. Valves deeply included. Seeds with long wings at the apex.

Hab. in sunny places of intra tropical New Holland, everywhere. Flowers in spring.

A medium-sized tree with the bark persistent, the outside falling off in dirty grey rough and wrinkled flakes. The inside brownish and coming away in little pieces. Leaves 3-5 inches long, 7-9 lines broad, somewhat thickly coriaceous, narrowed into a petiole of $\frac{1}{2}$ inch or shorter, the apex often produced into a narrow point. The common peduncles thick. Fruit greyish green, opaque, not smooth, 6-8 lines long, sometimes an inch, the mouth hardly dilated. The valves deltoid and acuminate.

Very like *E. terminalis* in habit and bark but differing in the fruits, which are a little smaller, or twice as small, as already described.

Bentham (B.Fl. iii, 257) puts the plant under *E. terminalis* F.v.M. without comment.

Mueller was often careless of his own species, thinking perhaps that descriptions were adequate, and sometimes visitors to his herbarium were careless, and sometimes accidents would happen, e.g. the permanent or temporary blowing away of a loose label. So that we must learn his ideas of his species, in the present case, in a more or less indirect manner.

Specimen (b), referred to on this page, has the label in Mueller's handwriting "*Euc. polycarpa* F.v.M., *Euc. pyrophora* Benth., Nichol Bay, Mueller." This I have already stated I believe to belong to *E. dichromophloia*. The material is scanty, and in any case the name "*polycarpa*" as applied to it would have no meaning.

There is, however, a second specimen extant, with a label in his handwriting "*Euc. polycarpa*, Charlotte Waters, *E. Giles*." He subsequently endorsed this "*E. terminalis*." It will be seen (fig. 6c, Plate 166) that the name *polycarpa* is at least appropriate to this particular specimen.

Subject to the reservations implied in the above statement, I am of opinion that it is not a valid species. In this I am but following Mueller himself. I think it will be useful to look upon it as a variety of *E. pyrophora* and give it the name var. *polycarpa*. The description of *E. polycarpa* F.v.M. may be provisionally adopted for the variety, and "Charlotte Waters, *E. Giles*" (named by Mueller himself *E. polycarpa*) as the type. It may be looked upon as a small-flowered, and probably small-fruited form of *E. pyrophora*.

RANGE (of *E. pyrophora*).

Bentham enumerates it from several localities, as stated at p. 320. I reject the Western Australian locality, as stated, but I am far from believing that the species will not be found in that State. It is a dry country species, and in addition to the Northern Territory (home of the type, and near which it has since been found), it has been abundantly traced in northern and western Queensland, adjacent to some arid New South Wales areas in the Paroo district and west of the Darling.

NEW SOUTH WALES.

Buds and flowers, fruits found, the last varying in size. "A widely distributed tree west of the Darling River, known generally as Bloodwood. Never found in large quantities—a few trees here and there, rarely becoming large enough for milling. 20–40 feet, bark soft, scaly, white in colour." Toorale-Goonery, Paroo district (J. L. Boorman).

QUEENSLAND.

It will be observed that the species has been traced from Cunnamulla, Jericho, the Georgina, &c., away to the Gulf of Carpentaria and so joining the Northern Territory localities.

Cunnamulla, the inflorescence smaller than the type (F. H. Perkins). Cunnamulla is the terminus of the so-called Western Line of Queensland. Jericho is on the Central or Rockhampton-Longreach Line.

(a) "'Desert Gum,' white stem, similar to those from Cobar, N.S.W." Jericho (Henry Deane). (I cannot trace the Cobar specimens). (b) "'Bloodwood.' Black scaly bark." Jericho (Henry Deane). Both specimens in flower, (b) has some intermediate leaves in addition. I cannot see any difference between them.

Georgina River (E. W. Bick through C. T. White).

Although the following authors attribute the plants referred to by them to *E. corymbosa*, it is probable that *E. pyrophora* is really referred to. The name Bloodwood is, of course, very widely used. I have recorded a specimen from Boulia, and Boulia and the Georgina are in the same general direction.

E. corymbosa Sm. The tree which is generally known as the Bloodwood, has been observed by me in all the open forests as far as the waters of the Mitchell, and I have little doubt that it is found round the coasts of Carpentaria. One never sees these gum trees growing in a cluster; they are always scattered. (Tension-Woods, *Proc. Linn. Soc. N.S.W.*, vii, 333.)

"*Eucalyptus corymbosa* Sm. The blossoms of this 'Bloodwood' are sucked for the honey by the Boulia and Georgina natives" (Roth, N.Q. Ethnography Bull. No. 3). (The flowers of *E. pyrophora* are large, and especially rich in honey.)

"The gum of this 'Bloodwood,' Boulia, 'Richindi,' is used both as a local and internal application for venereal sores; in the former case it is used as a powder and dusted on, in the latter it is boiled with water. In the Boulia, Cloncurry, Upper Georgina and Leichhardt-Selwyn districts." (Roth, Bull. No. 5).

A Bloodwood, at 1,400 feet. Prefers flats to ridges. Prairie, 30 miles east of Hughenden (R. H. Cambage, 3958; "same as 3906 and 3908"). No. 3908 is, however, *E. terminalis*.

This species was in flower at several places, including Frewhurst, the lower Flinders, and near Cloncurry, in August, 1913. The flowering period for *E. corymbosa* is February and March.

Trees which in habit appear to belong to the same species were flowering in August at Prairie, east of Hughenden (No. 3958), but the fruits are larger, being as much as 2.7 cm. long with a diameter up to 2 cm. and the rim is thick, the orifice measuring from about 1 to 1.5 cm. across, the capsule sunk (R. H. Cambage in *Proc. Roy. Soc. N.S.W.*, xlix, p. 410).

Bloodwood. On flat, bore-water land, scrub country, large *Bauhinia Cunninghamii* trees near. Saxby River (Miss F. Sulman). Buds, flowers, and fruits. The young buds show abundant bracts and bracteoles.

This is the tree referred to by Leichhardt as Bloodwood, near the junction of the Lynd and Mitchell Rivers. He writes:—"The bergue was covered with fine bloodwood trees" (p. 292), and "the bloodwood, the apple-gum, the box, and the flooded-gum, grew along the bergue of the river" (p. 296). He also mentions that the bloodwood was in blossom in June (p. 297). He refers to the tree again (p. 370), when on the Nicholson, and on three subsequent occasions (pp. 394, 473, and 529), the last being when near Port Essington. (R. H. Cambage in *Proc. Roy. Soc. N.S.W.*, xlix, 410, 1915.)

NORTHERN TERRITORY.

I have already expressed the view that the original description of *E. pyrophora* was originally drawn up from "Upper Victoria River, *Mueller*," (this would be on the Gregory Expedition of 1856). (Depot Creek, *Mueller*, specimens I have not seen, and as regards the other specimens quoted by Bentham, see p. 320.)

Armstrong River, near Victoria River (collected by R. J. Winters for G. F. Hill, whose No. 459 it bears). This came from a locality not very far from that of the type.

Between Bull Oak Creek and Crescent Lagoon, "of limited range as seen" (W. Baldwin Spencer).

RANGE (of *E. pyrophora* var. *polycarpa*).

The type comes from the southern portion of the Northern Territory, but it occurs in "sunny places of intra-tropical New Holland," meaning the northern parts of the Northern Territory passed over by the Gregory Expedition of 1856. It also probably occurs in North-western Australia. It abundantly occurs in western New South Wales, and it is not possible to believe that it is not to be found over wide areas in Queensland. It is an imperfectly known form at present.

WESTERN AUSTRALIA.

Perhaps the form of *E. pyrophora* referred to in B.Fl. iii, 258, under "with rather smaller flowers, Depuech Island, *Bynoc*," may be this variety. The variety should be searched for.

NORTHERN TERRITORY.

Charlotte Waters (E. Giles, in Melb. Herb.). This form will be found in many parts of the Territory yet.

NEW SOUTH WALES.

These localities, near the Darling River and beyond, will probably be also found to be localities for normal *E. pyrophora*, for I believe that that species and its variety *polycarpa* insensibly run into each other.

Buds, Brewarrina (Henry Deane). Fruits only available, Compton Run near Byrock (Henry Deane).

"*Eucalyptus terminulis* F.v.M. (Bloodwood), found on Mount Dijou, 5 miles east, but I can hear of it nowhere south of this." (R. H. Cambage in *Proc. Linn. Soc. N.S.W.*, xxv, 599, 1900.)

Buds. Mt. Oxley, 40 miles south-west of Bourke (E. Bêche). "A medium-sized tree of 30-50 feet. The bark is thick scaly. Sap-wood thick, pale yellow, the centre wood brown." Mt. Oxley near Bourke (J. L. Boorman). Buds young and consequently bracts and bracteoles evident.

Yanda (Bourke-Louth). Said to be the nearest point for Bloodwood, at the 21½ mile peg on the Louth road, on the junction of the red and black soil. There are 30-40 trees, some fairly large, with clean unbranched stems. Wood little cut here (J. L. Boorman).

Fruits. Summit (sandstone) of Trig. Station, North Louth (L. Abrahams). The fruits are elongated ovoid, smooth when new, and corky scaly when old, like the others.

Buds and fruits. Paroo River district (E. Bêche).

Buds and flowers. "Bloodwood." Thapagee, Wanaaring (P. J. Dalton). Mr. Dalton says of its timber: "Used for fencing posts, house-blocks, rails, flooring-boards, and is good for charcoal. It should be useful for railway sleepers." Wanaaring (H. L. Dale). Glabrous and scurfy.

Buds, Whittabranah, Tibooburra (W. Baetlerlen). Which brings us near to the north-west angle of the State

AFFINITIES.

Bentham himself (B.Fl. iii, 199) contrasts this species, *E. terminalis* and *E. dichromophloia* as follows:—

Fruit oblong. Operculum depressed, continuous with the calyx till the moment of separation		<i>E. terminalis.</i>
Fruit globular or ovoid, contracted at the mouth. Operculum of <i>E. terminalis</i> .		
Flowers large		<i>E. pyrophora.</i>
Fruit nearly globular, with a short neck. Operculum depressed. (Flowers smaller in the other species ?)		<i>E. dichromophloia.</i>

1. With *E. terminalis* F.v.M.

It will be seen, on reference to the original description of *E. pyrophora* (p. 320), that *E. terminalis* is the only species with which it was compared. "Flowers larger than *E. terminalis*." (Bentham, original description of *E. pyrophora*).

In addition, the peduncles and pedicels are thicker and the whole inflorescence more massive and succulent. Although a large-fruited species, *E. terminalis* fruits never attain the size that those of *E. pyrophora* do. See the solid woody fruit of fig. 3c, Plate 166, for example.

2. With *E. dichromophloia* F.v.M.

As an example of confusion which has arisen between *E. pyrophora* var. *polycarpa* (*E. polycarpa* F.v.M.) and *E. dichromophloia*, see under *E. pyrophora* (p. 321).

Speaking of northern Queensland, Mr. R. H. Cambage writes: "These two species are quite distinct and can be easily distinguished when seen from coach or train. At certain stages of growth the fruits might be confused with those of the Red-barked Bloodwood (*E. dichromophloia*). Its timber is redder than that of the Red-barked Bloodwood."

E. dichromophloia differs from *E. pyrophora* in the thinner leaves, smaller inflorescence and thinner, often very much smaller, and more globose urceolate fruits,

3. With *E. corymbosa* Sm.

Mueller, in "Encalyptographia" under *E. corymbosa*, says: "But the greatest embarrassment has arisen in specifying the limits, by which *E. terminalis* (*E. pyrophora* Benth.) may constantly be separated; thus Bentham was inclined to consider both as forms only of *E. corymbosa*, a view which the accumulation of much additional material has almost confirmed."

Admitting that there are strong resemblances between members of the Corymbosæ, and that, in bark and general appearance, *E. pyrophora* and *E. corymbosa* may often resemble each other a good deal, the differences are far too great to bring them under the same species. Plates 161 and 162 (Part XXXIX) may be referred to for *E. corymbosa*, and Plate 166 for *E. pyrophora*. The peduncles, pedicels, buds and fruits of the latter species are longer, larger, and coarser than in *E. corymbosa*.

4. With *E. Abergiana* F.v.M.

This will be referred to when *E. Abergiana* is reached.

DESCRIPTION.

CCXIX. *E. lævopinea* R. T. Baker.

In *Proc. Linn. Soc. N.S.W.*, xxiii, 414 (1898), with Plate X.

As the description will be found at length at Part I, pp. 36, 37, of the present work, it need not be repeated here. I have a note on the species in *Proc. Roy. Soc. N.S.W.*, lii, 499 (1918).

From what will be said presently, particularly in speaking of the variety *minor*, it will be seen that this Stringybark is no exception to the rule that such Eucalypts vary a great deal. The normal species, indeed the typical form, is figured at figs. 1 and 2 of Plate 167.

SYNONYM.

E. pilularis Sm. var. *Muelleriana* Maiden (in part).

In Part I, p. 34, of the present work, I looked upon *E. Muelleriana* Howitt, *E. dextropinea* R. T. Baker and *E. lævopinea* R. T. Baker as conspecific, and as forming a variety of *E. pilularis*. There is no doubt that *E. dextropinea* is but another name for *E. Muelleriana*, but I am now of opinion that *E. lævopinea* should stand.

VARIETY.

Var. *minor* R. T. Baker.

A tree with the same characters as the type, except that the buds are sessile and the fruits smaller. The oil, however, is white and thin, instead of a reddish colour as in the former species; the absence of colour is due to the presence of phellandrene. Otherwise the oil is identical in its chemical composition with that of the above species, being composed almost entirely of lævo-rotatory pinene. *Hab.* Barber's Creek (*H. Rumsey*). (R. T. Baker in *Proc. Linn. Soc. N.S.W.*, xxiii, 416 (1898).)

The variety has already been figured at Plate 38 (figs. 17a-d and 18a and b).

SYNONYM (of the variety).

E. Wilkinsoniana R. T. Baker in *Proc. Linn. Soc. N.S.W.*, xxv, 678 (1900), with a figure of a fruit at fig. 2, Plate XLVI. In the original description of *E. Wilkinsoniana*, *E. laevopinea* var. *minor* is given as a synonym.

A couple of years later, at p. 40, "Research on the Eucalypts," under *E. Wilkinsoniana*, Messrs. Baker and Smith say: "It was placed later as a variety of *E. laevopinea*, on chemical evidence alone, but when the tree was better known, its characters were such as to warrant specific rank. The red-coloured rim is quite absent from *E. laevopinea*." My experience in regard to the last sentence is quite different. I have often seen the red rim in *E. laevopinea* of all shapes and sizes of fruit.

In its typical form *E. laevopinea* is large-fruited, but smaller-fruited forms are found over a wide range. The form with the non-exsert valves to which the name *E. Wilkinsoniana* has been given, cannot be separated from *E. laevopinea*, even as a variety. Great acquisitions have been made to the National Herbarium during the last few years, and some forms have disclosed an amount of variation which was not thought possible at one time. I am of opinion that the Stringybark species are variable to an extent not exceeded by any other group of Eucalypts. The remarks made by me in regard to var. *minor* and *E. Wilkinsoniana* in this work, viii, p. 221, were written in 1903, and having been carefully re-examined with vastly additional material seem to be true now.

Messrs. Baker and Smith ("Research on the Eucalypts," 1902) state that the oils of *E. laevopinea* and *E. Wilkinsoniana* differ in the presence of eucalyptol in the latter, and in other details. I cannot trace any modification of this statement, and I challenge the general truth of it as regards the oils of, say, half a dozen trees reputed to be *E. laevopinea* and *E. Wilkinsoniana* respectively.

RANGE (of the normal form).

It appears to be confined to New South Wales.

It seems, in its approximately typical form, to be confined to the northern parts of New South Wales, *e.g.*, Rylstone, Upper Hunter, Liverpool Range, Counties of Hawes and Pottinger, Nundle, southern New England. Rylstone, the most southerly locality, is about 150 miles north-west of Sydney.

Following are some specimens represented in the National Herbarium, Sydney:—

Nullo Mountain, Rylstone, and Gulf road, Rylstone (R. T. Baker); the type.

“Mountain Stringybark” (A. Rudder). Identical with the Gulf road specimen. The valves well exerted, and the rim exceptionally broad. (Fig. 16, Pl. 4.)

Tomalla Table-land, head of Hunter River, opposite Belltrees (H. L. White).

Moonan Flat (J.H.M. and J. L. Boorman). (Fig. 22, Pl. 4.) Stringybark, Moonan Brook (E. C. Andrews per R. H. Cambage, No. 3582). Flat topped with very slightly exert valves.

“Stringybark,” Warrali Creek (Jesse Gregson). (Fig. 17, Pl. 4.)

Red Stringybark, Murrurundi Common (L. A. Macqueen, Forest Guard).

A Blackbutt, tall tree, dark brown fibrous bark to tips of branches. On eastern slope. Parish Vaut, County Hawes (E. H. F. Swain).

Very tall trees, similar to *E. pilularis* in growth. Bark rough to tips of branches. Nundle, Hanging Rock, 4,000 feet (J. L. Boorman, E. H. F. Swain).

Tree of 80 feet in height, with a girth of 8 feet. Parish Bundulla, County Pottinger, on slopes (Forest Guard M. H. Simon, No. 28).

Wollun Platform on the Main Divide, near Armidale (J. F. Campbell). Three miles east of Uralla (R. H. Cambage, No. 3784). Fruits smaller than the type.

On acid granite, Torrington (R. H. Cambage, No. 1824). The largest-fruited form I have seen. *E. macrorrhyncha*, *E. capitellata* and *E. eugenioides* in the district, practically within a few hundred yards.

RANGE (of variety *minor*).

This appears to be more widely diffused than the normal form, extending from Goulburn in the south to southern Queensland in the north. Goulburn, Barber's Creek (Tallong) and Sutton Forest, the most southerly localities, are on the Southern Table-land, between 90 and 136 miles south of Sydney.

SOUTHERN LOCALITIES.

Near Goulburn (Dr. J. B. Cleland). Barber's Creek or Tallong (H. J. Rumsey). Also labelled by Mr. Baker as the type.

Sutton Forest (R. T. Baker). Labelled by Mr. Baker as the type.

Kowmung River (R. H. Cambage, No. 2735). Almost typical for *E. Wilkinsoniana*.

The southern and northern localities will doubtless be found to be connected by means of the Blue Mountains and other spurs.

NORTHERN LOCALITIES.

Macdonald River, Howe's Valley, 40 miles from Singleton (R. H. Cambage, No. 1543). This is a diminutive fruited form of *E. laevopinea* in every respect, but it is different from the Barber's Creek specimen, whose nearest affinity is to *E. eugenioides*.

Murrurundi (J.H.M. and J. L. Boorman). Smaller fruits than type.

Rivertree, Upper Clarence River (R. H. Cambage, No. 2847). Nearly typical for *E. Wilkinsoniana*, and not to be distinguished from the Warrah Creek specimens recorded at p. 329.

I frequently find it difficult to say whether a certain specimen should be labelled *E. laevopinea* or its variety. For example, the specimens from Warrah Creek and Hanging Rock (already referred to under *E. laevopinea*), and Rivertree, just mentioned, include fruits so flat-topped that they were at one time put under *E. Wilkinsoniana* as typical for that reputed species.

Tenterfield, *via* Cottesbrooke, to Sandy Flat, just west of Dividing Range (J.H.M.). (Fig. 25, Pl. 4.) Some of the fruits of this specimen would also pass for typical *E. Wilkinsoniana*.

Drake (E. C. Andrews). Near those specimens of Barber's Creek, picked out as *E. Wilkinsoniana*.

Red Stringybark, but not deep red colour. Inner bark bright yellow. (N. Stewart, Forest Guard, Glen Innes.) Fruits in heads with very short thick pedicels. Slightly domed, otherwise resembling the Sutton Forest specimens of *E. Wilkinsoniana*.

Acacia Creek, Macpherson Range (William Dunn). A common Stringybark on the Macpherson Range. These specimens show inflorescence more or less capitate, fruits more or less domed; indeed there is a fair amount of morphological variation. Would be named *E. laevopinea* var. *minor* or *E. Wilkinsoniana* indiscriminately.

QUEENSLAND.

Near Mt. Gravatt, Brisbane (Dr. J. Shirley and C. J. White). The accompanying species principally *E. Planchoniana*, *E. Baileyana*, and *E. haemastoma*. These specimens strongly resemble those from Sutton Forest labelled *E. Wilkinsoniana*.

The common Stringybark of the district; runs out near Warwick. Stanthorpe (A. Murphy). Precisely same as Macpherson Range specimens.

Grey Stringybark, Benarkin (N. W. Jolly).

"Blackbutt," vicinity of Blackbutt Range, between Esk and Nanango (N. W. Jolly).

AFFINITIES.

This is a species with clavate, shiny buds, and commonly a flat, nearly horizontal rim, but with perplexing relations to *E. Muelleriana*, *E. eugenoides*, and *E. macrorrhyncha*.

1. With *E. capitellata* Sm.

Mr. Baker says: "In botanical sequence it may be placed after *E. capitellata*." I agree with Mr. Baker that the species has affinity to *E. capitellata*, but as the latter species is undergoing revision for the present work, it may be convenient to postpone consideration of its affinities until it is again dealt with.

2. With *E. eugenoides* Sieb.

In some cases, *e.g.*, Burragorang (R. H. Cambage), Bowral to Bullio, also Kangaroo Valley (R. H. Cambage and J. H. M.), it is exceedingly difficult to say where *E. eugenoides* and *E. laevopinea* (in its small forms) differ from each other, and it is difficult and sometimes almost impossible to separate them on morphological grounds. The seedlings of *E. eugenoides* are much more undulate and hairy.

3. With *E. macrorrhyncha* F.v.M.

Mr. Baker (original description) of *E. laevopinea*, says that myrticolorin, eudesmol and cineol, which are found in the leaves of *E. macrorrhyncha*, are absent from those of *E. laevopinea*. Nevertheless the domed fruits of both species (particularly when the buds of *E. macrorrhyncha* are rounded and not angular) make them sometimes difficult to discriminate.

4. With *E. Muelleriana* Howitt.

Morphologically *E. Muelleriana* is perhaps its closest affinity as regards buds and fruits, especially when the latter are flat-topped in *E. laevopinea*. The latter species gives one the impression of being a domed fruited form of the former. The juvenile foliage of both species bears a strong resemblance to each other.

DESCRIPTION.

CCXX. *E. ligustrina* DC.

In *Prod.* iii, 219 (1828).

THERE will be found a copy of the original description at p. 234, Part VIII of the present work. G. Don (*Gen. Hist. Dichlamydeous Plants*, ii, 819, 1832) gives a translation as follows :—

Operculum hemispherical, mucronate, shorter than the cup; peduncles axillary, compressed, length of the petioles; flowers 6-8 in a head; leaves linear-lanceolate, very unequal at the base and attenuated, acuminate at the apex. Native of New Holland. Sieb. pl. exsicc. nov. holl. no. 617. Leaves 2 inches long, and 4-5 lines broad. Petioles and peduncles 3-4 lines long. Perhaps the same as *E. salicifolia* Cav. *Icon.* 4, p. 376.

I have dealt with the reference to *E. salicifolia* in the form of a note at Part VIII, p. 234, which need not be repeated here.

Since the statement in this work (Part VIII) was made, I have obtained additional material of *E. ligustrina* type (in bud and leaf), and of *E. eugenioides* var. *nana*, and am unable to distinguish the former from some of the latter, our knowledge of the latter enabling us to practically complete the life-history of the species. The original description of *E. ligustrina* would have been inadequate except for the herbarium specimens, imperfect as they are. *E. ligustrina* is the adult form of that which was mainly depicted in the juvenile form in *E. eugenioides* var. *nana*.

The species may be described in the following words :—

In exposed situations in the Blue Mountains a dwarf, Mallee-like growth of Eucalyptus grows. The species is mainly *E. stricta*, sometimes admixed with a little *E. stellulata* var. *angustifolia* (published as *E. Moorei* Maiden and Cambage, later) in swampy places. On the King's Tableland, Wentworth Falls, we found a form of *E. eugenioides* which bears a remarkable resemblance to *E. stricta*, and in reference to its dwarf habit we style it var. *nana*. This is the first occasion in which we have found this species to form part of the dwarf gum-scrub in question.

It bears a strong resemblance to *E. stricta*, unless the inflorescence and fruits be examined; and we trust that the figures, aided by the following notes, will make the identity of this interesting plant quite clear :—

Sucker leaves.—Lower leaves almost cordate and very symmetrical. As growth proceeds they become ovoid and finally lanceolate. The lower cordate leaves about $\frac{3}{4}$ inch long by $\frac{1}{2}$ inch broad.

Mature leaves.—Thicker, and as a rule more symmetrical than those of the normal species. Narrow, lanceolate, those 2 inches in length (which is the normal length) being usually $\frac{1}{2}$ inch across. Some of the leaves are proportionately so narrow as to come within the designation of linear-lanceolate, which is, we believe, a very unusual circumstance in this species.

Fruits.—In shape not dissimilar to those of the normal species, but rather smaller in size.

Each individual fruit about $\frac{7}{32}$ of an inch in diameter; the whole packed into a head (consisting usually of 7 to 9 fruits) about half an inch in diameter. For figure of another head-fruited form of *E. eugenioides*, see No. 5, Pl. LX, 1896.

Height—5 or 6 feet, forming a dense scrubby growth.

—Although we have only found it at King's Tableland, Wentworth Falls, we think it very likely that further search will reveal its presence in other exposed situations on the Blue Mountains.

This is the original description of *E. eugenioides* Sieber var. *nana* Deane and Maiden, in *Proc. Linn. Soc. N.S.W.*, xxiii, 799 (1898), with Plate xxxiii. See also my note in *Proc. Roy. Soc. N.S.W.*, lii, 501 (1918).

I match a specimen, Lawson, Blue Mountains (J. H. Camfield, April, 1897), quite satisfactorily with the type of *E. ligustrina*, and it has fruits which connect it with those of the type of *E. eugenioides* var. *nana*. Mr. A. A. Hamilton, with specimens from King's Tableland (home of the type of the latter), has shown that it attains a height in that locality of 15 feet, and that it is a Stringybark. Its size is obviously a question of shelter. Some of the adult leaves from both Dapto and the Blue Mountains show that the name *ligustrina* (Privet- or *ligustrum*-leaved) has some appropriateness.

SYNONYMS.

1. *E. eugenioides* Sieber, var. *nana* Deane and Maiden (already referred to).
2. *E. oleifolia* Allan Cunningham (probably).

In his MSS. Journal I find the following entries :—

(a) At page 6: "Blackheath, 5th October, 1822, operculo hemispherico foliis (parvis) ellipticis ovali-lanceolatis mucronatis acutiplanis, umbellis axillaribus pedicellatis 9–10 floris. A low shrub 2 feet high."

(b) "A low shrub 1–2 feet high, verge of Regent's Glen." This is probably also *E. eugenioides* var. *nana*. I have very little doubt, but I have not seen specimens.

RANGE.

It is confined to New South Wales, and, so far as we know at present, to poor sandstone areas in the higher parts of the Blue Mountains, and west of Dapto, on the South Coast line.

It is a shrub of 5 or 6 feet, forming a dense shrubby growth at Wentworth Falls, Blue Mountains, developing into a small Stringybark tree.

Mr. R. H. Cambage has also collected it on a sandstone plateau about 1,700 feet high at West Dapto, about 60 miles south of Sydney. His note is: "Dwarf Stringybark, growing somewhat as a Mallee. Height, 2 feet 9 inches."

AFFINITIES.

With *E. eugenioides* Sieber.

The seedlings and juvenile leaves of *E. ligustrina* are on a diminutive scale as compared with those of *E. eugenioides*, but display an affinity with that species; indeed the nearest affinity of *E. ligustrina* is to *E. eugenioides*. The juvenile leaves of *E. ligustrina* are remarkably variable in shape (see the Plate in *Proc. Linn. Soc. N.S.W.*, 1898, No. xxxiii). Both are Stringybarks and both are well covered with stellate hairs. *E. ligustrina* has not been found to attain the dignity of a large tree.

DESCRIPTION.

CCXXI. *E. stricta* Sieber.

In Sprengel's *Cur. Post.*, 195 (1827).

THE original description consists of the following words:—

E. operculo submutico pedunculis lateralibus 2-floris linearibus acutis coriaceis glabris subpunctatis.

See also De Candolle's figure in *Mem. Myrt.* t. 8 ("the anthers incorrect," Bentham).* The type is Sieber's Pl. Exs. No. 472, and it is more fully described in DC. Prod. iii, 218, of which we find a translation in G. Don's "Dichlamydeous Plants," ii, 819, as follows:—

Operculum hemispherical, mucronate, shorter than the cupula; peduncles lateral, nearly terete, a little longer than the petioles; flowers 5-6 in a head; leaves stiff, linear-lanceolate, coriaceous, acuminate. Native of New Holland. Fruit globose, 3 lines in diameter. Petioles a line and a half long. Peduncles 3 lines long. Leaves 3 inches long, and 4 lines broad, rather shining, having the middle nerve hardly prominent, and the rest veinless.

I have described it on modern lines at p. 277, Part IX, of the present work, as *E. virgata* var. *stricta*.

The juvenile leaves, figured at fig. 6, Plate 167, have not previously been figured or described. They are lanceolate or narrow lanceolate, acuminate, with well defined, spreading veins, the intramarginal vein well removed from the margin.

The arboreal forms referred to under *E. stricta*, at Part IX, pp. 278 and 282, are partly *E. stricta* (as regards the Falconbridge specimens), but mainly referable to the now better known *E. fraxinoides* Deane and Maiden (see Part XXXIX).

The normal form is depicted at figures 12-15 of Plate 43, and also at figures F and G of Plate 94 of my "Forest Flora of New South Wales." The coarser arboreal (Falconbridge) form is figured at 4a, Plate 44.

The figure of *E. stricta* in *Bot. Mag.* t. 7074 puzzles me. The specimen figured was 30 feet high in the Temperate House at Kew; it is therefore not the normal species, which is a shrub. At the same time, it attains a larger size exceptionally (e.g., the Falconbridge specimens), but the plant figured at t. 7074 is a narrow-leaved plant. The fruits depicted (which are from herbarium specimens) probably belong to *E. fraxinoides* Deane and Maiden, which has been dealt with in Part XXXIX of the present work. This is a species which attains tree size, and which was formerly, as regards some of the

* For a discussion on the anthers in *E. stricta* see Part IX, p. 279.

specimens, placed under *E. stricta* (arboreal form). The plant that Sir Joseph Hooker gathered on the road from Sydney to Botany Bay in 1841 is *E. obtusiflora* DC., which is very close to *E. stricta* and which has been labelled "*E. stricta* var." by Mueller and many others.

Nothing more can be said in regard to t. 7074, unless the locality whence the seed was obtained can be traced.

SYNONYM.

E. virgata Sieb. var. *Stricta* Maiden, in my "Forest Flora of New South Wales," xxv, 86 (1907). See also at Part IX, p. 277, of the present work.

RANGE.

It has not hitherto been found out of New South Wales. It is a denizen of sterile rocky country, in its normal, shrubby form, but it attains greater height in the better soil and more sheltered situations of the taluses of some mountain localities. It has not hitherto been found near the sea-level, though it should be looked for (it may possibly be confused with *E. obtusiflora* DC.) towards the Victorian border. It occurs in the mountainous country from the Braidwood district to the Blue Mountains; roughly the localities may be separated into south and north, as follows:—

Southern localities.—The only species of Eucalyptus found on the summit of Currockbilly. A small Mallee-like growth of 3-5 feet, plentiful on the western slope in a permanently wet bog. Currockbilly Mountain, near Braidwood (J. L. Boorman).

Rarely reaches beyond 12 feet in height. Nerriga, about half-way on the Nowra-Braidwood road (J. L. Boorman).

About 4 to 7 feet high, on sandstone. Top of Table Mountain, west of Milton (R. H. Cambage, No. 763).

Talwong, 5 miles as the crow flies from Tallong, but on the opposite side of the Shoalhaven River. Said to be rare locally (A. Rumsey).

Top of mountain, about 1,700 feet above sea-level. Hawkesbury sandstone, West Dapto (R. H. Cambage).

Top of sandstone peak, Bindook road, Yerranderie (R. H. Cambage, No. 2195). This is westerly of the above localities.

The following locality brings us within 20 miles of Sydney :—

National Park (J.H.M.). Narrow leaves, typical. This is the nearest locality to the "Port Jackson" district as recorded by Bentham. It does not occur around Port Jackson.

Western localities.—It is very abundant on the Blue Mountain Range; it seems superfluous to give a complete list of localities. Mr. Cambage and I gave the following note on walking over the Blue Mountains :—

"Our first specimen was observed just past Faulconbridge Station, and was 9 inches in diameter, with a height of 20 feet. It is worthy of remark that the young leaves contain caoutchouc. In favourable localities this species, usually a shrubby plant, grows taller, with fewer flowers and coarser foliage. The coarseness of the species appears to be a matter of good soil and shelter." (*Proc. Linn. Soc. N.S.W.*, 1905, p. 196.)

Mt. Wilson and Mt. Tomah (Jesse Gregson). Common as far as Clarence Siding and beyond (J.H.M.).

"Small tree or shrub, with a smooth brown bark which does not vary in colour on the stem, but the small branches have a reddish appearance. Height from 4–8 feet." Jenolan Caves (W. F. Blakely, No. 446).

In Part IX, p. 282, I referred to an aberrant specimen from Molong, of which I had received imperfect material under the name of "Mountain Ash." Its position must remain uncertain until we obtain adequate material.

AFFINITIES.

1. With *E. obtusiflora* DC.

E. stricta opercula may be rugose and may be bluntish, showing transit to *E. obtusiflora*. *E. obtusiflora* is dealt with in Part XXXIX at p. 295, which may be referred to.

2. With *E. apiculata* Baker and Smith.

In view of the fact that *E. stricta* suckers may be quite narrow, it is often quite difficult to draw a line of demarcation between the two species. *E. apiculata* is figured and described in Part IX of the present work.

DESCRIPTION.

CCXXII. *E. grandis* (Hill) Maiden.

In *Journ. Roy. Soc. N.S.W.*, lii, 501, 1918. Ex Walter Hill in "Catalogue of the Timbers of Queensland" (Lond. Exh., 1862), p. 25. See also this work, Vol. XXIII, p. 58, with Pl. 100, figs. 8-13.

FOLLOWING (1) is Mr. Walter Hill's imperfect description of his *E. grandis* in the "Catalogue of the Timbers of Queensland," prepared for the London International Exhibition of 1862 :—

(1) *Eucalyptus grandis* Hill, Myrtaceæ, Flooded Gum. [Diameter] 40-60 [inches], [height] 90-140 [feet].

A majestic tree, inhabiting the rich alluvial flats upon the banks of rivers, and in such has a pillar-like trunk, clear of branches for three-fourths of its entire height. The timber is in high repute for strength, lightness (it floats in water when dry), and durability, and can be had in great quantities.

See also :—

(2) Flooded Gum (*Eucalyptus grandis*), native name "Toolur." Grows in bush on basalt, or on the edges of scrubs. It has a white bark which peels off right down to the ground. It grows to a great height, and is the lightest of all the gums hereabout (South Queensland), floating in water soon after being cut. It is easily cut by saw, but shrinks very much in drying. It is used for weatherboards, and sometimes for making parts of drays and carts. Also used for masts, spars, and planks of vessels. (W. Pettigrew in *Proc. Queensland Philos. Soc.* 1877 (1878).)

Mr. Pettigrew acknowledges his indebtedness to Mr. Walter Hill, who was then Director of the Botanic Gardens, Brisbane.

E. grandis Hill is referred to in my "Forest Flora of New South Wales," i, 79, and, although not then formally described, was to be found in the Kew Herbarium and some other herbaria, and, in the light of later knowledge, the informal description of Mr. Walter Hill, as there quoted, is quite clear, and, since it is backed up with herbarium specimens, might be claimed to be sufficient, if it were desired to give it specific rank.

The above is noted in Part XXIII, p. 58, of the present work.

Under the name *E. saligna* Sm. var. *pallidivalvis* Baker and Smith, "Research on the Eucalypts," p. 32 (1902), it was described as follows :—

The herbarium material of this tree is altogether much coarser than that of the type.

The leaves are large and broad, and generally dry a fresh, green colour, with a whiteness near the midrib, and a pale under-surface. Branchlets angled. Peduncles flattened, about 6 lines long, bearing generally over six flowers, pedicel 4 lines long. Calyx 2 lines in diameter, tapering into the pedicel. Operculum hemispherical, acuminate.

Fruit uniformly pear-shaped, on a short, thick pedicel, or sessile, *glaucous*, about 3 lines in diameter, sometimes angled, rim thin, capsule sunk; valves exerted, obtuse, white.

In *Journ. Roy. Soc. N.S.W.*, lii, 501 (1918), I recapitulated the evidence, quoted the figures at Part XXIII of the present work, Plate 100, figs. 8-13, thus making the species quite clear. It may be more correctly described in the following words:—

A majestic tree, attaining a height of 90-140 feet, and a diameter of 40-60 inches. In rich alluvial flats has a pillar-like trunk, clear of branches for three-fourths of its entire height. Known as "Flooded Gum" because of the situations it prefers, the timber red, in high repute for strength, lightness (it floats in water when dry), and durability.

Juvenile leaves not seen.

Mature leaves broadly-lanceolate to lanceolate, acuminate, petiolate, up to 21 cm. long (say 8½ inches) and 6 cm. broad (say 2½ inches), with numerous fine nearly parallel veins making an angle of about 45° with the midrib; the intramarginal vein not very far removed from the edge.

Peduncles flattened, about 6 lines long, bearing generally over six flowers, pedicel 4 lines long.

Calyx-tube 2 lines in diameter, tapering into the pedicel. Operculum hemispherical, acuminate.

Anthems same as those of *E. saligna*.

Fruits uniformly pear-shaped, on a short, thick pedicel, or sessile, *glaucous*, about 3 lines in diameter, sometimes angled, rim thin, capsule sunk; valves exerted, obtuse, white.

It is figured at Plate 100, figs. 8-13.

SYNONYM.

E. saligna Sm. var. *pallidivalvis* Baker and Smith in "Research on the Eucalypts," p. 32 (1902).

RANGE.

It is found in coastal New South Wales and the Southern Tableland, from Barber's Creek northwards to northern Queensland. As it is not yet well understood even yet, its range should be further inquired into, particularly in regard to the unrecorded gaps from Barber's Creek to Booral, and from southern to northern Queensland.

NEW SOUTH WALES.

Messrs. Baker and Smith record it from Barber's Creek, in the Goulburn district, N.S.W., which is much the most southerly locality recorded.

It was collected by George Caley in the Sydney district (probably somewhere about the Hawkesbury—he did not explore more than 100 miles from Sydney to the south, and probably less to the north) in 1800-1810, 59 being the British Museum number of specimen kindly presented by Dr. A. B. Rendle, F.R.S. Caley stated the native name to be "Calangara."

It is represented in the National Herbarium, Sydney, from the following localities:—"Flooded Gum," Booral district (A. Rudder); Port Stephens (Miss Connolly); "Flooded Gum," Failford to Forster (J.H.M.); Port Macquarie (G. R. Brown), as "Blue Gum"; Coff's Harbour (J. L. Boorman), as "Blue Gum"; Moonee, Woolgoolga (E. H. F. Swain), as "Blue Gum"; "A gum, purple bark, shaggy base, on poor soil," Woolgoolga (E. H. F. Swain); Alstonville, Lismore, and Ballina (W. Baeuerlen); Richmond River (C. Fawcett); Mullumbimby (W. Baeuerlen).

The original describers of it as a variety recorded it from the following northern localities:—Gosford, Narara, Booral, Bullahdelah, Lismore, and Tumbulgun.

QUEENSLAND.

"Flooded Gum," creeks north of Macpherson Range (R. N. Jolly); Maroochie (F. M. Bailey); Beech Mountain, near Canungrera; also Tambourine Mountain (J. Shirley); Blackall Range (C. T. White); "Flooded Gum," Landsborough (P. MacMahon), in leaf only.

By far the most northerly locality is that of the following, sent by Mr. District Forest Inspector H. W. Moeatta from northern Queensland. "Flooded Gum. Near Atherton and throughout northern table-lands; found principally in high country on scrub fringes, very tall, straight barrel of large girth, carries black scaly bark from 10 to 15 feet upwards from butt, thence upwards a white smooth bark, continually shedding outer bark in long festoons from branches downwards."

(The specimen referred to under *E. saligna* in B.Fl. iii, 245, as "Richmond River (Beckler)" is *E. grandis*.)

It is cultivated in Algiers, North Africa, under the name of *E. botryoides* var., according to a specimen I received from Dr. L. Trabut, No. 110, in 1904.)

VARIETY.

grandiflora Maiden.

In *Proc. Roy. Soc. N.S.W.*, lii, 502 (1918).

Many species have a large-fruited form, and it appears to me that *E. grandis* is one of these. Fruits cylindroid, slightly urceolate, 1 cm. long, 8 mm. broad, calyx-tube usually with one marked rim tapering into the flattened pedicel. Peduncles 2-2.5 cm., flattened. The fruits glaucous, valves slightly exsert. E. H. F. Swain, Carinda, near Woolgoolga, N.S.W., No. 47, associated with Blue Gum, Ironbark, and Apple (September, 1905).

This is identical with or closely allied to (1) Bulladelah, N.S.W. (A. Murphy, Jr., June, 1911); (2) "Rough bark up to limbs, but not Bangalay (*E. botryoides*)," Green Point, near Gosford, N.S.W. (A. Murphy, July, 1910).

This proposed variety requires further investigation. It has red timber, and varies in regard to the amount of rough bark on the butt. It has affinities both with *E. robusta* Sm. and *E. Kirtoniana* F.v.M.

It is figured at figs. 7 and 8, Plate 167.

AFFINITIES.

With *E. saligna* Sm.

E. grandis is often called "Flooded Gum," and it is a pity that the name cannot be reserved for it. At the same time, it is often called "Blue Gum" (a name I should like to see reserved to *E. saligna*) by experienced people, while normal *E. saligna* is often more or less glaucous. The fruits have often a slightly urceolate shape, and sharp, inflexed valve-tips. As a rule, though not invariably so, the buds and fruits are slightly larger than those of *E. saligna*.

It is because of the confusion of vernacular names, that the timbers of *E. grandis* and *E. saligna* are still more frequently confused than they should be. As compared with *E. saligna*, the timber of *E. grandis* is slightly paler in colour, lighter in weight (it floats in water when dry), shrinks more, is tougher, is not so durable, and is, therefore, chiefly used for inside purposes in preference to such uses as fence-posts. Both are shaft-like Gums, attaining great development in sheltered, deep-soil, well-watered valleys.

Explanation of Plates (164-167).

PLATE 164.

E. terminalis F.v.M.

- 1a. Juvenile leaf; 1b, mature leaf; 1c, fruits. Darwin, Northern Territory. (H. I. Jensen and G. F. Hill, No. 398.) It is probable that these specimens are very near the type. Note in 1a the hairiness, the triplinerved venation, and in 1c, the long fruit.
2. Scurfy buds. Darwin. (N. Holtze, seen by Mueller.) Probably very near the type.
- 3a. Umbel of flowers, with scurfy calyx-tubes; 3b, front and back views of anthers. Darwin. (G. F. Hill, No. 343.) Probably very near the type.
- 4a. Mature leaf; 4b and 4c, fruits, the latter with thick rim. Darwin. (G. F. Hill, No. 425.) Mr. Hill points out that he sees no difference between his 398 and 425, and they are probably very near the type.
- 5a. Smaller mature leaf; 5b, fruits with thick rim. There is a thick rim also in 4c, and indeed it is common in the species. Darwin. (Collector of Mueller, 1890.) Probably very near the type.
6. Fruit. Pine and Horseshoe Creeks, near Darwin. (E. J. Dunn.)
7. Fruit. Bathurst Island, Northern Territory. (G. F. Hill, No. 470.)
- 8a. Mature leaf; 8b, buds; 8c and 8d, fruits. Goody Goody, near Derby, North-West Australia. (W. V. Fitzgerald, No. 301.)
9. Rather squat, not quite mature fruit. (We have a similar shape, No. 13, from Emerald, Queensland.) Base of Mount House, Kimberleys, North-West Australia. (W. V. Fitzgerald No. 970.)
- 10a. Mature leaf; 10b, unripe buds. Palmer River, North Queensland. (Dr. W. E. Roth.)
11. Unripe buds. Rockhampton, Queensland. (J.H.M.)
- 12a. Broad, intermediate or nearly mature leaf; 12b and 12c, fruits. North Rockhampton. (Andrew Murphy.)
13. Immature fruit, spotted and scurfy, almost fleshy. Compare No. 9. Emerald, Queensland. (J. L. Boorman.)
14. Fruit. Gadwall, Alpha, Queensland. (G. T. Wood)

PLATE 165.

E. terminalis F.v.M. (See also Plate 164.)

- 1*a*. Mature leaf; 1*b*, buds and flowers; 1*c*, shrunk, scurfy, immature fruit; 1*d*, 1*e*, 1*f*, mature fruits. Warialda, N.S.W. These were all collected on barren sandstone country, 4-6 miles on the Inverell-road, 1*a*, 1*d*, 1*e*, 1*f*, by J.H.M. and J. L. Boorman; 1*b* by Henry Deane; 1*c* by W. A. W. de Beuzeville, of the Forestry Commission.

In this species the mature leaves are sometimes seen in an opposite state, reminding one of *Angophora* and of other *Corymbosæ*; the scurfy almost fleshy immature fruit is common in the species.

E. dichromophloia F.v.M.

- 2*a*. Long mature leaf; 2*b*, immature buds; 2*c*, anthers; 2*d*, fruits, taken from a drawing by Miss M. Smith, of a co-type in the Kew Herbarium labelled "*E. dichromophloia* Ferd. Mueller, Roper River, Dr. M [ueller], 1857." There is a second specimen on the sheet from the Abel Tasman River (Northern Territory) in mature leaf and early bud, in no way differing from the Roper River specimen as far as it goes.
3. A small loose leaf in the Melbourne Herbarium labelled "*E. dichromophloia* F.v.Mueller, Roper River."
- 4*a*. Immature buds; 4*b*, fruit; 4*c*, winged seed. All from a packet labelled "Roper River," attached to the sheet containing No. 3. It will be observed that fruits 4*b* and 2*d* show some differences, which are not insuperable.
- 5*a*. Mature leaf; 5*b*, immature bud; 5*c*, fruit. This fruit is smaller, daintier and more fragile than fruits 2*d*, Fitzmaurice River, Northern Territory (Mueller). Reputed to be a co-type, and, like 2, collected on Gregory's Expedition. See p. 314.
6. Intermediate leaf, with fruits precisely matching 5*c*. Burrundie, Northern Territory. (Dr. H. I. Jensen, No. 361.)
- 7*a* and 7*b*. Fruits. Umbrawarra, Northern Territory. (Dr. H. I. Jensen, No. 410.) The leaves of this specimen precisely match No. 6. The fruit 7*a* precisely match the small Fitzmaurice River specimen 5*a*, while that of 7*b* closely resembles one of the Roper River fruits (not drawn).
- 8*a*. Twig bearing mature leaf; 8*b*, top view of a fruit. Endeavour River, Northern Queensland. (Lieut. King, ex. Herb. Lambert in Herb. Cantab. Probably a specimen collected by Allan Cunningham in Capt. King's circumnavigation of Australia in 1821.)
- 9*a*. Leaf; 9*b*, buds; 9*c*, front and back view of anther; 9*d*, fruit. Reid River, *via* Townsville, Northern Queensland. (Nicholas Daley.)
10. Fruit, not quite ripe. Townsville. (R. H. Cabbage, No. 3803.)
11. Fruit. Chillagoe, Northern Queensland. (E. Doran.)
12. Fruit, rather large. Mount Morgan, near Rockhampton. (C. F. Henrickson.)
- 13*a*. Mature leaf; 13*b* and 13*c*, buds in two stages of development; 13*d*, immature fruit, showing style. It is striate inside the calyx-tube; 13*e*, fruit. Wyndham, North-west Australia. (A. E. V. Woodroffe.)
- 14*a*. Very small mature leaf (compare 3); 14*b*, fruit; 14*c*, winged seeds. Summit of Mt. Augustus, W.A. (J. Forrest, 1883.) Mueller labelled this *E. terminalis*; see p. 317.

PLATE 166.

E. pyrophora Benth.

- 1*a*. Mature leaf (retored); 1*b*, large, rounded rusty buds; 1*c*, front and back view of anthers. Upper Victoria River, Northern Territory. This bears the label of locality in Mueller's handwriting, and, in addition, the words "*E. pyrophora (terminalis)*, Mueller, 1856." It is from the Melbourne Herbarium and is believed to be a co-type of *E. pyrophora*. See p. 320.
- 2*a*. Mature leaf; 2*b*, corymb of plump buds and an expanded flower (note the coarse peduncles and pedicel.). Near Crescent Lagoon (Darwin to Roper River), Northern Territory. (Prof. Sir W. Baldwin Spencer.)

PLATE 166—continued.

E. pyrophora Benth.—continued.

- 3a. Bud; 3b, immature fruits; 3c, mature fruit (very thick-walled in this species). Saxby River, Northern Queensland. (Miss F. Sulman.)
- 4a. Juvenile leaf (glabrous); 4b, intermediate leaf; 4c, flower with flattish operculum showing no clear line of separation from the calyx-tube. Jericho, Queensland. (Henry Deane.)
- 5a, 5b. Fruits; the inflorescence similar to 2b. Toorale-Goonery, Paroo River District, far west of N.S.W. (J. L. Boorman.)

Variety *polycarpa*.

- 6a, 6b. Mature leaves, both in the sheet in the Melbourne Herbarium labelled "*E. polycarpa*, Charlotte Waters (Northern Territory) E. Giles" (see p. 324), and believed to be the type of *E. polycarpa* and therefore of var. *polycarpa*. All the specimens are loose, and it is suggested that 6b is probably identical with fig. 14a, Plate 165, and that 6a is the normal foliage of var. *polycarpa*.
- 7a. Buds; 7b, fruit. Paroo River District, N.S.W. (E. Bêche.) These specimens show that *E. pyrophora* and *E. polycarpa* belong to the same species.

PLATE 167.

E. lavopinea R. T. Baker.

- 1a. Juvenile leaves; 1b, 1c, fruits; 1d, front and back view of anther. Drawn from the author's original Plate X, *Proc. Linn. Soc. N.S.W.*, Vol. xxiii (1898).
- 2a. Intermediate leaf; 2b, mature leaf; 2c, buds; 2d, fruits. Nulla Mountain, near Rylstone, N.S.W. (R. T. Baker.) These specimens presented to me as the type.

E. ligustrina DC. (*E. eugenoides* Sieb. var. *nana* Deane and Maiden).

3. Portion of the type of *E. ligustrina* DC., being Sieber's No. 617.
- 4a, 4b, 4c. Various forms of juvenile leaves; 4d, flowering shoot; 4e, fruits. Redrawn from the drawing of the type of *E. eugenoides* var. *nana* in *Proc. Linn. Soc. N.S.W.*, Pl. XXXIII, Vol. xxiii (1898). King's Tableland, Wentworth Falls, Blue Mountains, N.S.W. (J.H.M.)
- 5a. Mature leaf; 5b, anther. From a small tree 15 feet in height. King's Tableland, Wentworth Falls. (A. A. Hamilton.)

E. stricta Sieb. (See also figures 12–15 of Plate 43, Part IX.)

6. Narrow lanceolate juvenile leaves, not quite in the opposite stage. King's Tableland, Wentworth Falls. (A. A. Hamilton.)

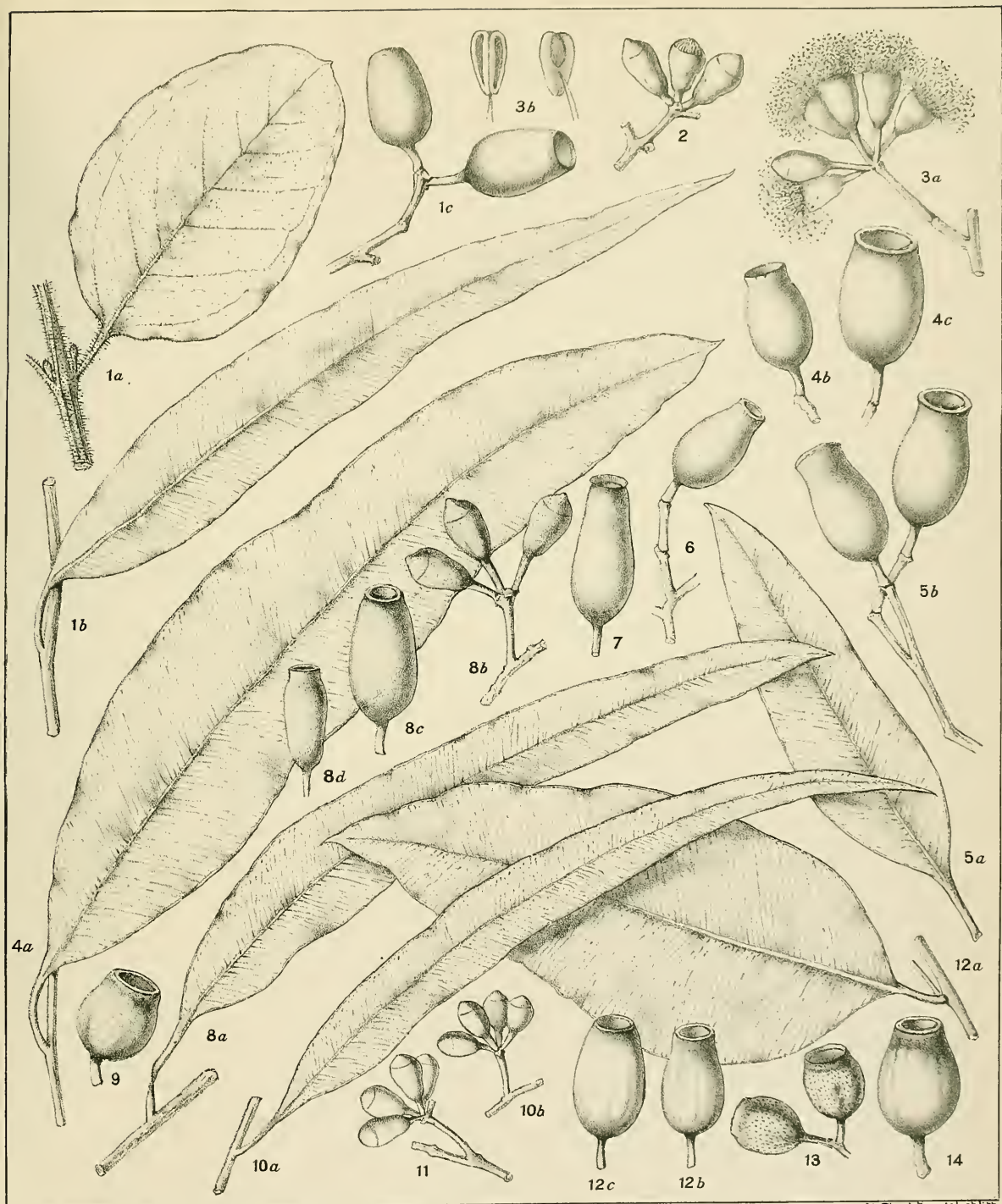
E. grandis (Hill) Maiden, var. *grandiflora* var. nov. (See also figs. 8–13, Plate 100, Part XXIII.)

- 7a. Mature leaf; 7b, 7c, immature fruit in various stages; 7d, fruits. Near Woolgoolga, N.S.W. (E. H. F. Swain, No. 47.) The type.
- 8a. Buds; 8b, front and back views of anther. Bulladeelah, N.S.W. (Andrew Murphy, Jr.) Not quite typical.

The following species of *Eucalyptus* are illustrated in my "Forest Flora of New South Wales"* with larger twigs than is possible in the present work; photographs of the trees are also introduced wherever possible. Details in regard to their economic value, &c., are given at length in that work, which is a popular one. The number of the Part of the Forest Flora is given in brackets:—

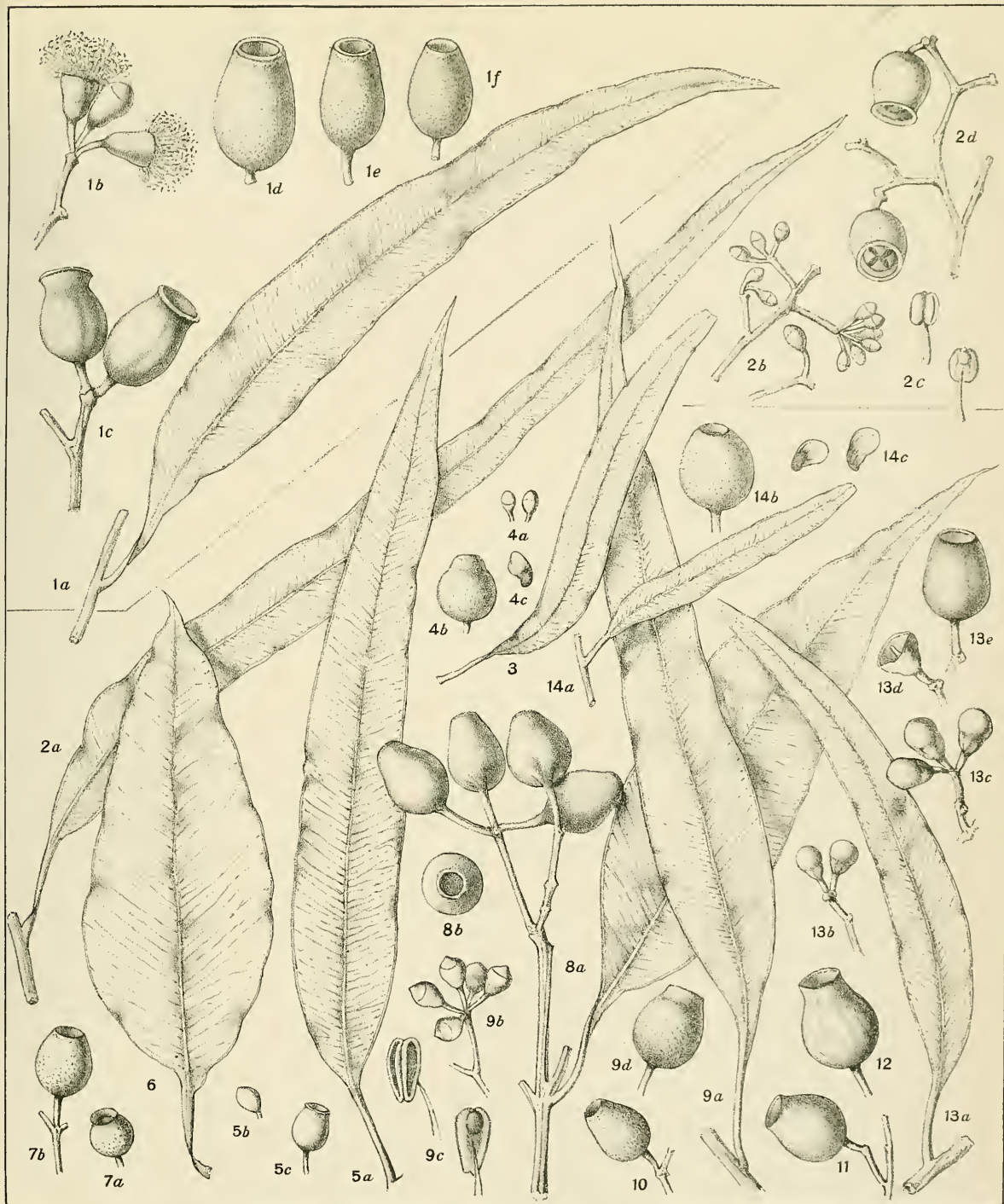
- | | |
|---|--|
| <i>acacioides</i> A. Cunn. (xlviii). | <i>melliodora</i> A. Cunn. (ix). |
| <i>acmenioides</i> Schauer (xxxii). | <i>microcorys</i> F.v.M. (xxxviii). |
| <i>affinis</i> Deane and Maiden (lvi). | <i>microtheca</i> F.v.M. (lii). |
| <i>amygdalina</i> Labill. (xvi). | <i>numerosa</i> Maiden (xvii). |
| <i>Andrewsi</i> Maiden (xxi). | <i>obliqua</i> L'Hérit. (xxii). |
| <i>Baileyana</i> F.v.M. (xxxv). | <i>ochrophloia</i> F.v.M. (l). |
| <i>Baueriana</i> Schauer (lvii). | <i>odorata</i> Behr and Schlechtendal (xli). |
| <i>Baueriana</i> Schauer var. <i>conica</i> Maiden (lviii). | <i>oleosa</i> F.v.M. (lx). |
| <i>Behriana</i> F.v.M. (xlvi). | <i>paniculata</i> Sm. (viii). |
| <i>bicolor</i> A. Cunn. (xliv). | <i>pilularis</i> Sm. (xxxi). |
| <i>Boormani</i> Deane and Maiden (xlv). | <i>piperita</i> Sm. (xxxiii). |
| <i>Bosistoana</i> F.v.M. (xliii). | <i>Planchoniana</i> F.v.M. (xxiv). |
| <i>Caleyi</i> Maiden (lv). | <i>polyanthemus</i> Schauer (lix). |
| <i>capitellata</i> Sm. (xxviii). | <i>populifolia</i> Hook. (xlvii). |
| <i>Consideniana</i> Maiden (xxxvi). | <i>propinqua</i> Deane and Maiden (lxi). |
| <i>coriacea</i> A. Cunn. (xv). | <i>punctata</i> DC. (x). |
| <i>corymbosa</i> Sm. (xii). | <i>regnans</i> F.v.M. (xviii). |
| <i>crebra</i> F.v.M. (liii). | <i>resinifera</i> Sm. (iii). |
| <i>dives</i> Schauer (xix). | <i>rostrata</i> Schlecht. (lxii). |
| <i>fruticetorum</i> F.v.M. (xlii). | <i>rubida</i> Deane and Maiden (lxiii). |
| <i>gigantea</i> Hook. f. (li). | <i>saligna</i> Sm. (iv). |
| <i>goniocalyx</i> F.v.M. (v). | <i>siderophloia</i> Benth. (xxxix). |
| <i>hamastoma</i> Sm. (xxxvii). | <i>sideroxylon</i> A. Cunn. (xiii). |
| <i>hemiphloia</i> F.v.M. (vi). | <i>Sieberiana</i> F.v.M. (xxxiv). |
| <i>longifolia</i> Link and Otto (ii). | <i>stellulata</i> Sieb. (xiv). |
| <i>Luehmanniana</i> F.v.M. (xxvi). | <i>tereticornis</i> Sm. (xi). |
| <i>macrorrhyncha</i> F.v.M. (xxvii). | <i>virgata</i> Sieb. (xxv). |
| <i>maculata</i> Hook. (vii). | <i>vitrea</i> R. T. Baker (xxiii). |
| <i>melanophloia</i> F.v.M. (liv). | |

* Government Printer, Sydney. 4to. Price 1s. per part (10s. per 12 parts): each part containing 4 plates and other illustrations.



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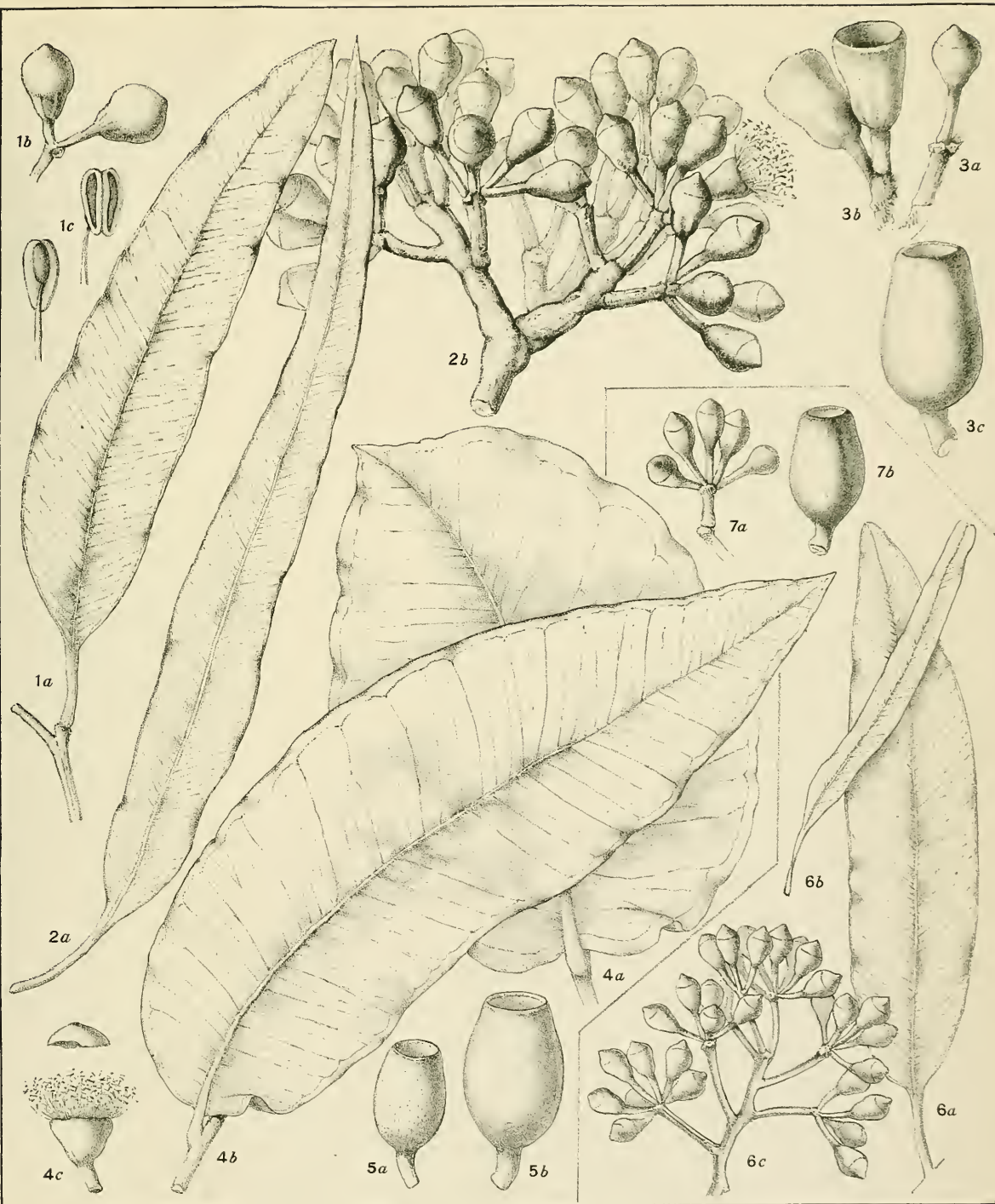
EUCALYPTUS TERMINALIS F.v. M. [See also Plate 165.]



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EUCALYPTUS TERMINALIS F v. M. (1) [See also Plate 164.]

E. DICHROMOPHLOIA F.v. M. (2-14)



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EUCALYPTUS PYROPHORA BENTH. (1-5)

E. PYROPHORA BENTH. var. POLYCARPA (6-7)



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EUCALYPTUS LÆVOPINEA R. T. BAKER (1-2) E. LIGUSTRINA DC. (3-5)

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